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Why Not the Trolley-bus?

THE importance of the tramways to the electrical industry can be gauged to some extent by the energy they consume, which amounts to over 700 million kWh annually, and all that that implies in the way of plant and equipment. It is, therefore, a matter for concern that each year recently has seen a decline in the number of routes in operation.

There are several good reasons for this. The chief is that in many areas the cost of track renewal makes tramcars more expensive to run than other forms of transport that have come to the fore since the days when they provided easily the most efficient form of conveyance by road. Whether, in scrapping existing systems, due consideration has been given to the many remarkable improvements in design that have been made in late years is open to question. It can only be said that if a public transport service were being started to-day in such areas tramcars would not be chosen.

That is not to regard the tramways as obsolete. Even did they not show superior economy at high traffic densities, their greater passenger capacity would justify their retention for the present in larger towns.

It is significant that three-fifths of the total energy consumed by the eighty-five tramway undertakings in operation outside London is taken in half a dozen large towns. No doubt in the future the tramway load will be further curtailed. Nevertheless, this ought not to bring loss to our industry if the claims of the trolley bus are now being properly staked out.

But are they? Justification for uneasiness is to be found in the Ministry of Transport's Return for 1935-36. While the reduction in the number of passenger journeys and in the consumption of the tramways was more than made up for by the trolley buses, it is disappointing to find that of fifteen tramways which ceased operation in 1934-35 only one went over to trolley buses, and of eleven in 1935-36 only two did so.

This may be due in part to a continuance of the momentum given to the internal-combustion-engined bus before the evolution of its electric competitor had reached its present stage, but enough data is surely available now to enable the latter to make a better showing than this.

There is another reason, however, and that is that, while traffic density may determine the economic dividing line between the two types of electric vehicle, the cost of electricity enters into the equation for the lower service frequencies at which the petrol or compression-ignition bus may be cheaper, since it has not to meet out of an exiguous revenue standing charges on distribution and overhead equipment.

Figures given as competitive costs for electricity as against fuel oil at its present price range from 0.5 to 0.75d. per kWh, but traction tariffs vary as incomprehensibly from area to area as they do for other uses of electricity. Many transport managers regard this as the crux of the matter—that, and uncertainty as to future relative incidence of taxation on the two kinds of bus.

Technical progress may be anticipated in such directions as: lowered weight, thus increasing accommodation; higher average speeds, reducing the number of trolley buses required; lessened energy consumption, 10 per cent. saving having been obtained with regenerative control; insulation of both poles; the use of high-voltage feeders; and possibly a closer approach to standardisation of vehicles.

All such engineering developments will reinforce the *prima facie* case for electricity on economic grounds. The last word will, however, be with the public, which will demand a vehicle that can not only be pulled up to the kerb, but which also gives the quiet running, smooth acceleration and travelling comfort associated with the trolley bus alone. Experience suggests that the increase in passenger journeys under such conditions will more than compensate for losses in the few cases in which it will be unable to provide the best method on economic grounds.

The Henley Celebrations

THE banquet held on Friday last to close the series of events organised in celebration of the W. T. Henley centenary will be remembered as one of the outstanding events of what promises to be in many ways a brilliant year. Of Henley's career and work we have written already but we believe that those who have known the company and its work for a lengthy period will feel that it was peculiarly fitting to the occasion that the chairman should pay special tribute to the late Sir George Sutton, Bt. As a comparatively young man he took the helm when Henley died in 1882 and held the complete confidence of strong influences about him, so that, as Sir Montague Hughman said, it was largely due to his wonderful powers of organisation and administration that the company had reached its present pre-eminent position. Sutton was a man of exceptional energy, ability and foresight, bold but not restless to the point of recklessness, who developed the business on such sound principles as to bring it back to prosperity by the end of last century. While to Henley and to Sutton at different times and in different ways belongs great credit for the work of years that are gone, it is equally true that the company owes much to many others who within comparatively recent years have either died or retired from its service. Continued progress is, however, assured for all great industrial companies by men upon whom worthily rests the mantle of their predecessors, and the point of these observations is to wish success to those who have proved, or are proving, themselves prepared to adapt their policy and practice to whatever changes the very promising years ahead are likely to bring.

The Ironmongers Persist

FOR the past year or more the Electrical Section of the Ironmongers' Federated Association has been actively pursuing a policy designed to make its members a solid unit in the electrical industry. Electrical ironmongers want equal status with existing electrical trade associations but desire to retain their separate identity. The existing associations have pointed out the advantages of membership and negotiations have been proceeding for some time. We gather, however, from recent remarks by Mr. E. B. Holloway, the hon. secretary of the Section, that the prospect of a settlement on these lines is not very rosy. But, as we have said before, we do not consider that yet another independent electrical association is desirable at a time when there is every reason for unity in the industry to ensure sound trading in reliable apparatus.

A Consumer's Complaint

IT was recently reported in a local newspaper that a consumer had complained of being unable to get sufficient heat in his electric cooker. The explanation forthcoming from the electrical engineer was that he had asked for authority to install a transformer kiosk in the vicinity four or five months before, but had not had time to do it. Quite frequently we have heard users of gas stoves grumble at lack of pressure due, presumably, to choked pipes or to the demand being too great at a particular time, and it is a selling point for the electric cooker that the heat is constant, provided that the supply voltage remains at the proper level. The distinction is one that we feel should be jealously guarded quite apart from the legal requirement regarding voltage regulation.

Looking Forward

THREE pointers to how the electrical industry in this country may be expected to fare during the present year are the trends of electricity generation, employment, and overseas trade in 1936. The first, details of which we published last week, more than fulfilled the most sanguine anticipations, the increase being far ahead of anything previously recorded, while the fact that the maximum output was in December against a reduction in the last month of 1935 warrants the belief that production will soar even more rapidly this year. At the beginning of last year there were 4,869 unemployed in the electrical engineering industry, and 3,308 at the end of the year. In wiring and contracting the numbers were 4,116 and 3,490, and in electric cable, apparatus, lamps, &c., 11,982 and 7,676, so that here, too, the record is a good one. On pages 139 and 140 of this issue we analyse the Board of Trade returns of electrical overseas trade. Exports fluctuated considerably each month, but an upward movement is discernible, partly accounted for by rising prices. Special home needs—lighting equipment for the Coronation and plant for power station extensions to meet the rapidly increasing consumption—have probably, to some extent, diverted attention from markets abroad, especially foreign ones with economic and financial difficulties. Nevertheless, the year finished on a high note, the December exports being 27 per cent. above those in the corresponding month of 1935, so that in overseas trade as well as employment and output there is every reason for optimism among those engaged in electrical work.

Registration and Approval

FOR many years the compulsory registration of electrical contractors has been a plank in the E.C.A.'s platform. That this is as much the concern of their principal employés is evident from the report just presented by a special committee of the Association of Supervising Electrical Engineers. The committee reviews the practice in some of the British Dominions, and outlines a possible scheme. It envisages the establishment of a board which, as regards the most important part of its functions, would bear a very close resemblance to the registration board of the National Register of Electrical Installation Contractors, but equipped with the powers of compulsion of which that body feels the lack. Beyond this, however, the nature of appliances supplied to the public would come within its ken, following the practice in Ontario. In conjunction with the B.S.I., an approval mark would be applied to all appliances conforming with given standard specifications—a consummation devoutly to be wished. If and when the Government decides to act upon (or against) the recommendations of the McGowan Committee, perhaps it will find a means of bestowing these powers on any new body which may be set up, and thus bring about a very desirable reform.

Preventing Switch-House Fires

MUCH has been said and written of late regarding the necessity for adequate sectionalisation of high-voltage switchgear with a view to confining the effects of fire due to failure of circuit-breakers or of insulation. Coming down from principles to practical details, the vital point is that everything depends upon the section switch, which must be capable of being operated in all circumstances. There are many ways in which section switches can be safeguarded, and in this issue Mr. A. J. Nicholas discusses their relative merits. Another point of importance to which he refers is the difficulty of gaining accurate information as to internal deterioration of bushing members of existing switchgear by means of power-factor tests. On standard forms of gear on which insulators are electrically in parallel an average value is obtained, which may be of little use as a guide to a specific weakness. On the other hand, to provide for special sectionalisation of insulators involves considerable complication in manufacture, with resultant increase in cost.

Which Bridge?

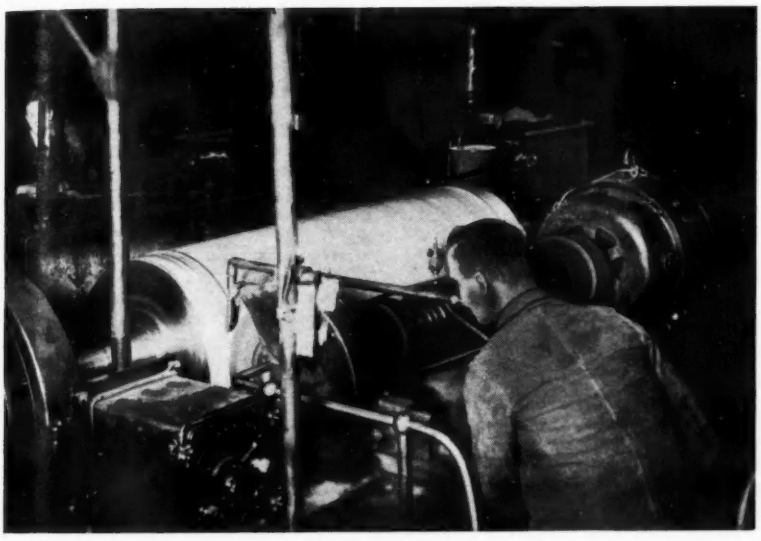
A CORRESPONDENT, referring to a handsome handbook recently issued by London Associated Electricity Undertakings, draws our attention to the fact that the Battersea power station is shown in an included map as situated by Battersea Bridge, whereas in point of fact it stands by Chelsea Bridge. We can only suggest that the names of the bridges shall be changed over to avoid confusion.

Development Activities in Manchester

Enterprise in many directions

IN an area of fifty-seven square miles, for the most part densely populated and embracing every possible type of consumer, electricity supply growth is almost inevitable, but a well-designed load-building organisation speeds up development and directs it along the right lines. Such a city is Manchester, where recently, through the courtesy of Mr. H. C. Lamb, the chief engineer and manager of the Electricity Supply Department, we were able to see something of the Department's activities.

The influence of the growth of the city on electricity supply can be judged from the case of Wythenshawe, Manchester's new satellite town. This district has residential and industrial zones which will ultimately have a population of over 100,000,



Calender bowls of compressed Egyptian cotton being finished off at the Mather & Platt works

and already accommodates factories which produce biscuits, confectionery, electrical accessories, embroidery, hosiery, milk services, pepper and spices, and quilts. Manchester has felt the industrial depression more than most large towns, and the textile trade is still only convalescent, yet the total sales for the last year showed an increase of 19 million kWh, or 3.97 per cent., to 498,434,394 kWh.

There are few outstandingly large works in the area, there is no marked drift of industry into the city, many of the wealthier citizens live outside the area of supply, and the majority of the new houses are of the cheaper class. In the seven months from March to October last year the total number of consumers increased by 11,926 to 145,000.

"High-pressure" salesmanship is not favoured by the Department; it prefers to rely upon well-thought-out schemes of tariffs and hiring services, and reasoned argument. It is considered that good service cannot be offered where overselling is permitted, and also that it is unjust to permit one class of consumer to be subsidised by another class.

Obtaining the good will of the consumer is a first principle of the undertaking. It is secured and maintained by its representatives continually travelling throughout the area and discussing with all types of consumers their particular electrical problems and acquainting them with the service rendered by the undertaking. One particularly good service is the issue free to power consumers quarterly of the undertaking's live house journal the "Power Service Bulletin."

Manchester is one of the few undertakings where, generally speaking, domestic and industrial sales are handled entirely by separate departments. The sales manager is responsible for domestic sales and lighting applications, while the power sales engineer is responsible for industrial and commercial business, as well as water-heating sales. Water-heating business is held to demand the individual survey work of the power sales section, rather than the group salesmanship for which the domestic sales section is particularly designed.

Another aspect was presented by a water-heating assistant to the power sales engineer, when he told us that it was much easier to secure a water-heating job once the salesman was actually on the premises. In fact, nearly 80 per cent. of water-heater inquiries received at the offices of the Department are converted into orders by "follow-up" salesmanship.

One of the larger types of water-heating installations is at a large works at Hendham Vale, where a 40-gallon storage heater is specially designed to work in conjunction with the existing boiler of a canteen cooking range which is not much used for actual cooking. Normally a large fire assists the water heater, but the latter alone is capable of meeting the full hot-water demand when necessary. During the day hot water is used in the kitchen at the various wash bowls, and at night it is available for the cleaners. About sixty people are catered for and the running cost is about 1s. 8d. per day.

Business in connection with smaller water heaters is secured mainly by an attractive hire service, but it is also stimulated considerably by arranging with builders and estate agents to place self-contained water heaters in flats and other premises. The importance of the 1½-gallon water heater is indicated in the "Bulletin." Among the diverse situations suggested are over the kitchen sink, in the doctor's surgery, and in the works manager's office.

To quote from the statistics of the undertaking for 1935-36, the classes of supply are proportioned as follows: industrial 48.9 per cent., commercial, institutional and domestic 22.3 per cent., street traction 9.2 per cent., bulk supplies 17.8 per cent., and street lighting 1.8 per cent. The industrial consumption can be sub-divided into: engineering works 13.7 per cent. (68.2 million kWh), textile industry 8.4 per cent. (41.6 million kWh), chemical works 8.1 per cent. (40.6 million kWh), miscellaneous 18.7 per cent. (93.2 million kWh).

The largest of these trade groups, engineering, is exemplified by an astonishing variety of products, and by firms whose names are known throughout the world. For example, Richard Johnson & Nephew, Ltd., have a large export business in galvanised-iron wire, to which is now added copper and aluminium transmission lines. Locomotives, automobiles, oil-engines, worm and gear wheels, bumper springs, driving chains, twist drills (made in large quantities in Openshaw), switchgear, and electric motors are other Manchester products.

A display of Wild-Barfield furnaces at the industrial demonstration showroom

And when we add aircraft, textile machinery, pumps, rubber-manufacturing machinery, transformers, meters, radio apparatus and gasworks plant (the now familiar "waterless" gas holder originated in Manchester), it will be realised that the cotton textile business is not the only staple trade of Manchester.

Rubber manufacture is quite an important industry in Manchester, there being twenty or so factories which represent a consumption of nearly 20 million kWh per annum. In the works of Messrs. Cohen & Wilks, Ltd., we saw a good example of the many clothing factories (particularly raincoats) which contribute considerably to the undertaking's load. The principal operations are the cutting of cloth to pattern in layers of a few dozen thicknesses by hand cutters, and sewing. A 4½-h.p. motor drives two band cutters and the group drives for the sewing machines generally provide 1 h.p. for eight machines.

In the "Bulletin" of March, 1936, is an excellent example of a group drive by a 150-h.p. slip-ring motor for 330 looms. It replaces a horizontal steam engine, and the average speed of the looms has been increased by 2 per cent. with a corresponding increase of output.

Among the new applications of electricity which the undertaking is developing is spot welding, and it is considered that the small spot welder is one of the most useful contributions to the many industries employed on light metal work; several resistance welders of 100 to 200 kVA are in use. We learnt of an interesting major repair job. The cylinder of a large turbine was found fractured at the exhaust end. The casting at the point of the fracture was 2 in. thick and the crack extended for 2 ft. This was successfully welded and an X-ray photograph indicated the thoroughness of the repair.

Other new applications are thermal-storage space heating, heavy-duty cooking, and industrial furnace work, and the following notes refer to a few typical installations of these classes. The new Town Hall extension (adjoining the Central Library) is being equipped with thermal-storage heating plant, and the combined plants (comprising four 3,000-kW electrode boilers) will probably be the largest "office" heating plant of its kind in the country. The new University refectory kitchen has nearly 100 kW of electric cooking plant and completes an impressive list of large electric kitchens which have been added to the mains in recent years. Interesting industrial-heating installations include Héroult and high-frequency melting furnaces, 480 kW of type-melting pots in a newspaper foundry, a 450-kW meter enamelling oven, many electric welders in sizes up to 200 kVA, and a great variety of smaller electric resistance furnaces. In fact, it appears that almost every modern application of industrial electric heat can be found on the Electricity Department's mains.

As a further indication of the diverse nature of the load we may quote the following examples taken from the records at random:—Office heating, heating linseed oil tanks, supplementary power in textile factories, wash-boilers for tea brewing for factories and offices, and church heating. A list of industrial heating installations representing a total of 884 kW revealed particularly varied uses, from shirt-collar band heating (500 W) to engineering welding (200 kW for twenty-six machines).

The public services in Manchester contribute handsomely to the undertaking's load. Two of the three hydraulic power stations in the city are now electrically driven, and at the Manchester sewage disposal works at Davyhulme are a 15,000 cu. ft. turbo-blower driven by an 810-h.p. motor and two 10,000 cu. ft. blowers each driven by a 540-h.p. motor.

Importance is attached to the electric vehicle which is quite common in the area and we were informed of an "electric" owned by the York Raising & Dyeing Co., Ltd., which for the past twelve years has been delivering cotton goods to Manchester warehouses and is still going strong.

There is keen rivalry with oil engine manufacturers in respect of some of the new installations, and a considerable amount of the new industrial load comes from the conversion of private power plant. A complete survey of consumers' generating plant has been made and a careful watch is kept upon engines still running for any signs of the situation changing in favour of public supply. Each one of these prospective change-over jobs is classified under such headings as: "Good prospects of conversion in near future"; "Power plant efficient and conversion in near future not hopeful"; "Conversion difficult under present conditions."

Automatic chain-making machines at the works of the Renold & Coventry Chain Co.

Maps of districts with prospective consumers clearly shown represent other excellent survey work. The success of this surveying for business is largely dependent on the statistical and other information which is made available to the sales staff by the efficient office machine. A complete consumers' record printed in four large volumes is primarily divided in street order, the name of each of the 135,000-odd consumers being given with a code number signifying his trade or business and the type of supply—a.c. or d.c. Returns from the large power consumers give particulars of the loads. Then there are cumulative records, compiled from daily returns of connected loads. Further, the power sales engineer has mailing lists indexed alphabetically and by trade classification.

The unceasing effort, imagination and enthusiasm behind all this routine work is largely reflected in the demonstration workshop to which consumers and prospective consumers are invited from time to time to witness different types of equipment in operation, and where possible to bring along their practical problems for solution. Each demonstration is continued for from ten to fourteen days and the following subjects are being treated more or less regularly in co-operation with manufacturers:—Industrial heating, welding, large-scale cooking, commercial baking, wood working and machine-tool work. Added prestige is given to the workshop by professional patronage such as that represented by the attendance of members of technical associations At cooking demonstrations the services of a chef from a large staff kitchen have been obtained.

A successful example of specialisation in sales work is found in the lighting service conducted mainly among industrial and commercial consumers to advise on tariffs and to suggest installation improvements, to aim at adequate lighting facilities in all new buildings, and to increase lighting sales generally. Premises are visited, tests taken and consumers furnished with complete lighting layouts, trial installations being arranged, where necessary, to convince the consumer of the merits of the suggested improvements. The service is greatly appreciated and is of considerable value in maintaining the confidence of people with whom contact is made.

In a recent issue of the *Bulletin* Mr. J. W. Howell (E.L.M.A.) gave recommended values of illumination for machine shops and textile mills. For instance, rough and extra fine machine work are allotted 7 to 9 and 25 to 50 foot-candles, respectively, while carding and weaving processes in the textile mill require 5 and 8 foot-candles, respectively. A good example of discharge lighting with 400-W lamps is to be

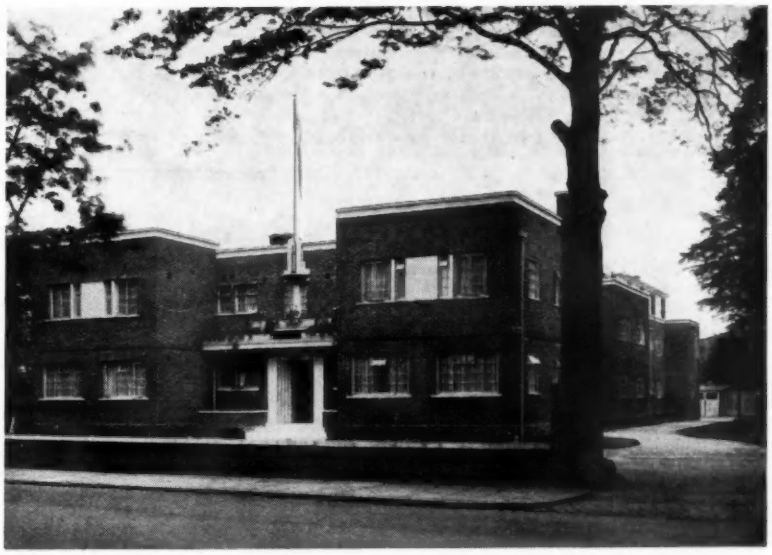
seen in the machine shop of the Renold & Coventry Chain Co., Ltd.

Over 9,000 street lighting fittings, representing over 3,000 kW, have been installed on 200 miles of roadway, and about 700 new fittings are installed annually. The lanterns are supported on weldless steel poles, the mounting height varying from 13 ft. to 25 ft. and the lamp loading from 100 W to 1,500 W, according to the road classification

On the domestic side greatest attention is probably given to the cooking and water-heating business. Generally, tariff reduction is the biggest business-getting scheme, and in three years consumers have been benefited to the extent of £266,000 by the reduction of the lighting rate to 4d. per kWh, the minimum charge to 6s. 6d. per quarter and the minimum assessment for the all-in tariff to £10. Of the 11,000-odd existing houses connected in seven months, about 6,000 were secured under the Department's assisted wiring schemes.

Hire purchase facilities are also responsible for much of the load building. At the end of October last there were 17,900 cookers, 2,600 water heaters and 1,300 wash-boilers out on hire. The importance attached to the contractor at Manchester can be appreciated when it is learned that 800 applications per month for connections under the assisted wiring scheme are received through contractors and without direct initial effort on the part of the undertaking, other than general advertising.

Showroom service has been an important plank in the sales promotion platform for some years and, judging from a glimpse at the particularly extensive showroom which is being incorporated in the new Town Hall extension, we should say that



The Didsbury Court all-electric flats

Electrically driven band-cutters at a raincoat works

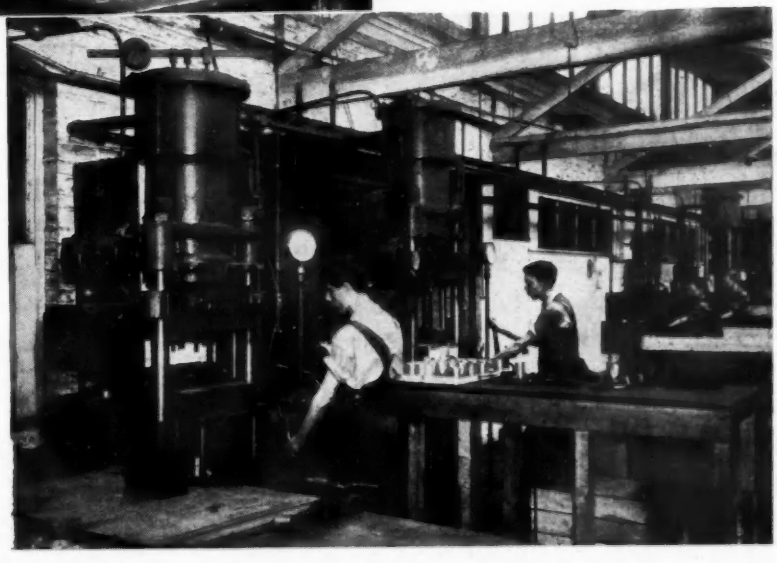
the importance of the service is likely to be very much increased. Demonstrations in cookery and other services are given twice weekly to audiences of from 25 to 30 people. Every year four suburban exhibitions are held, each district being visited once every three years. They are held in local halls and schools, and as the result of advertisement by Press, invitation card and poster they are well attended. Portable show stands designed for quick erection and dismantling permit the various sections of domestic service to be portrayed separately.

One important section is the repair service. A man is engaged on repair work in full view of visitors. Apart from prestige value, this service ensures that much apparatus which would otherwise be put aside is kept in service. A cake-baking competition is a lively feature of these exhibitions. Prizes of electrical apparatus are offered and there have been as many as sixty entries. The services of an expert from the School of Domestic Economy are secured for judging the cakes made by the competitors.

The importance of house building activities in connection with both private enterprise and Corporation housing schemes has not been overlooked. Immediately on receipt of information regarding new house building, contact is made with the architects and builders with a view to provision being made for heating and cooking and the use of smaller domestic electrical appliances. Where possible the addresses of house purchasers and tenants are obtained, and the persons in question are at once approached. Concessions are offered to builders of an additional six yards of free service cable if not fewer than two 15-A power plugs are installed. About 3,000 houses have qualified for this allowance.

Equipment in Flats

Good progress has been made with "coal-electric" houses. In co-operation with the housing director a large number of houses and flats have been equipped for all-electric operation, with the exception of one coal fire in the living room. Such installations include 58 houses on the Burnage estate, 50 houses at Brownley Green, 181 flats at Smedley Point and 204 flats at Kirkmanshulme Lane. All Corporation dwellings, even where gas services are provided for cooking and washing, are now wired with a small plug for



Electrically heated bakelite moulding presses at the works of Parmiter, Hope & Sugden, Ltd.

a portable appliance and with heating plugs in bedrooms.

Private builders are also developing their estates on similar lines, and it is estimated that 800 "coal-electric" houses are now occupied or in the process of completion. Of the few blocks of residential service flats in Manchester the largest and most recent one, Didsbury Court, is equipped for all-electric operation. The twenty-two flats are completely furnished and equipped for electric lighting, heating, cooking, water heating and refrigeration. For optional service there is a coal fire in the lounge.

The undertaking has recently introduced a scheme for the hire purchase of a 3 cu. ft. refrigerator on the basis of £1 deposit and 2s. 6d. per week for five years, including free maintenance.

Electricity Supply in Queensland

THE Royal Commission on Electricity appointed in December, 1935, under the chairmanship of Mr. J. R. Kemp, to examine the present position of electricity supply in Queensland and to make recommendations for future economic expansion has now been issued. Sixty-two undertakings (forty-one local authority) are in operation, of which fifty-one possess generating stations. Outside Brisbane the largest stations are those of the Barron Falls Hydro-Electricity Board (4,400 kW of water power and steam engines) and Townsville City Council (3,810 kW of steam turbines and steam engines). Thirty-one stations are of less than 250-kW installed capacity, mainly provided by oil engines.

Brisbane, where more than two-thirds of the 152 million kWh generated by public authorities in Queensland in 1935 was used, is served by the City Council (56,250 kW) and by the City Electric Light Co. (37,500 kW). The consumption per head from all sources in Queensland was 210 kWh compared with 1,745 in Tasmania, 512 in New South Wales and 490 in Victoria, although the tariffs compare favourably with those in force elsewhere. Nearly 60 per cent. of the population lives in 2.86 per cent. (19,200 sq. miles) of the total area of the State, *i.e.*, in the south-eastern corner near the seaboard, and here 122 million units was generated in 1935.

Except for the Brisbane City Council, few local authorities have carried out appreciable rural extensions, and one of the main considerations of the Royal Commission has been to make electricity available to farmers for milking, irrigation, and refrigeration (the cost of electric motors being given as one-third of that of engines) and to replace imported oil fuel by locally produced coal.

The Commission is convinced that rural electrification can be successful only when combined with an urban system. A scheme was put forward by the Brisbane City Council under which it would supply in bulk at 33 kV to joint boards which would distribute the energy in the surrounding districts, the wholesale price being the lowest that would not involve the Council in a loss. This was not received favourably, as the boards might not be able to retail energy at a competitive price and retail charges would not be uniform.

The City Electric Light Co. submitted proposals for the complete electrification of a wide area, with provision for interconnecting with the transmission system of New South Wales and for local oil-engine stations as stand-by. Transmission would be at 66 kV and 11 kV with distribution at 415-240 V. The first stage would involve a capital expenditure of £450,000 on plant and mains. Retail prices were to be 10 per cent. above those charged in Brisbane.

Partly as a result of the successful activities of the State Electricity Commission of Victoria, the conclusion is reached that the control of generation and distribution throughout the whole area should be vested in the Government and operated by an Electricity Commission of four persons with a specialised knowledge of electricity supply problems, only one of whom would be a whole-time member. The Commission should be first of all a controlling body and later an operating authority. In view of financial and other difficulties in acquiring existing undertakings immediately, however, it is suggested that the City Company should put its scheme in hand forthwith but that its request for a forty-two year tenure should not be accepted.

With regard to the remainder of Queensland, with the exception of the northern coast, no large rural development is likely and the undertakings would be operated locally. The Barron Falls hydro-electric scheme, the possibilities of the Tully Falls, the Somerset Dam and the electrical development of the area round Cairns would be referred to the proposed Electricity Commission for investigation.

The Electricity Commission should be empowered to compel an existing electrical authority (1) to extend its operations if the work would be profit producing within two years or to refrain from doing so if the possible revenue would be unsatisfactory, and (2) to generate or purchase its supplies in bulk at rates to be approved by the Electricity Commission. At the discretion of the Electricity Commission, the permissible voltage variation should be increased from ± 4 per cent. to ± 6 per cent.

The compulsory acquisition of wayleave rights, control of the materials of installation of private plant, and approval of electrical apparatus with Commonwealth co-ordination, the preparation of wiring rules with the aid of the Standards Association of Australia, and assisted-wiring and appliance-hiring schemes are all regarded as matters for consideration.

Gauging Fine Wires

METHODS for the continuous measurement of the diameter of a moving wire include those depending on (1) the detuning of an oscillating circuit by a change of capacity or inductance due to variation in diameter of the wire; or (2) the varying output of a photo-cell due to the changing width of a projected shadow of the wire. These and certain other methods, say K. Dahl and J. Kern in *Elektrotechnische Zeitschrift* (Vol. 57, p. 1423), are either difficult to operate, yield only qualitative results, or permit measurement of the variation in only one diameter. The method illustrated by the accompanying diagrams is simple, quantitative and reliable. A graphic record of the variations in cross section of the wire is obtained, and can be reproduced with certainty in the same or another apparatus of the same type.

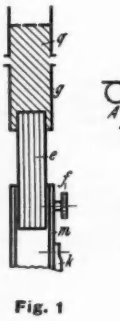


Fig. 1

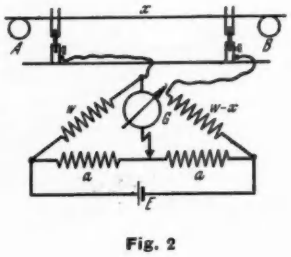


Fig. 2

The measurement is effected by the galvanometer or bolometer-amplifier G of a bridge circuit, one arm of which contains a length x of the wire under inspection. The wire runs continuously at from 3 to 5 metres (9.8 to 16.4 ft.) per min. between the feed and take-up coils A B and, its length and specific resistance being constant, its resistance is inversely proportional to the sectional area of the wire. The autographic record of G can, therefore, be calibrated to show directly the percentage variations in section of the wire under observation.

Contact with x is maintained by running the wire through holes about 0.5 mm. (0.02 in.) diameter in the walls of glass tubes, g in fig. 1, containing mercury q. Connection to the mercury is effected by an iron rod e held by a screw f in a brass sleeve m to which the cable lug k is attached. Current from the bridge is taken from a 4-V accumulator. The resistances a are of 100 ohms. To avoid appreciable heating of the wire under test, the current through it is limited to about 2 mA by making w equal 1,000 ohms. As the resistance x is usually of the value of 100 ohms or less, $(w-x)$ is about 900 ohms.

This method is usually applied to wires of from 0.01 to 0.04 mm. (0.0004 to 0.0016 in.) diameter. Fluctuations in resistance of 0.1 per cent. are clearly recorded, corresponding to changes of 0.00001 mm. in the diameter of a 0.01 mm. wire. The speed of travel of the wire is only limited by the aperiodicity of the recorder. The measurement is based not on the absolute resistance of the length x, but on the difference between the resistance of the wire leaving and that of the wire entering the position x.

The actual test length has, therefore, little effect on the record so long as the change in section extends over a considerable length of wire. This is usually the case and x can then be 20 in. or longer. If there are local defects, these can be recorded by placing the contacts closer together, thus reducing the length of wire in the bridge circuit and consequently the resistance in circuit.

The method does not discriminate between changes in resistance due to variations in diameter and those due to differences in specific resistance, but the latter are of rare occurrence and in most applications variations from either cause would be equally objectionable.

Switchgear Fire Risks. By A. J. Nicholas, A.M.I.E.E.

Insulation and sectionalisation

SWITCHGEAR fire hazard arises from one of two sources, either the failure of the oil circuit-breaker or the failure of insulation. If an order of importance is to be given to these two factors, the reliability and efficiency of the oil circuit-breaker must be granted first place since the result of circuit-breaker failure is disastrous, it being the final safeguard of plant and supply against insulation failures.

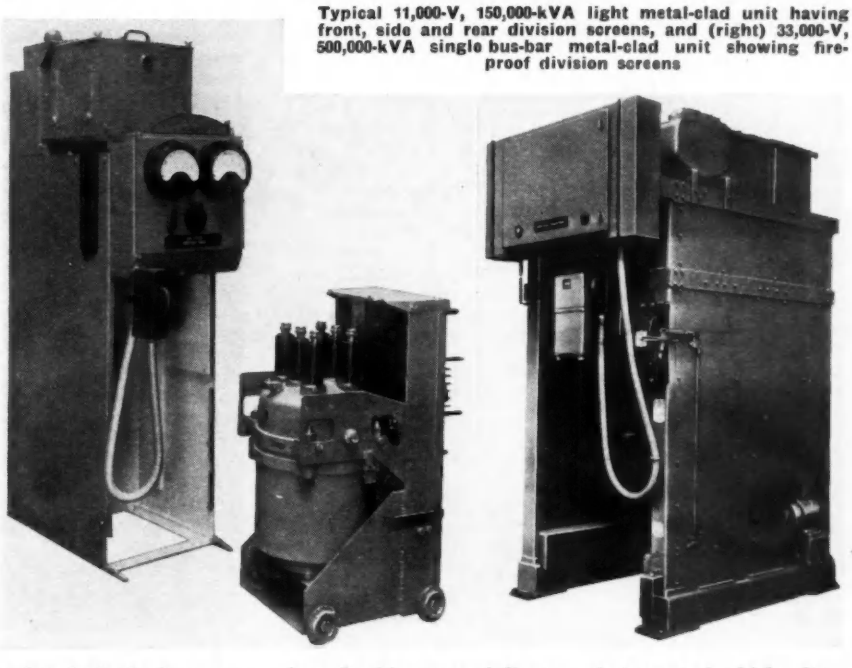
The report of the Committee set up by the Electricity Commissioners to consider what precautions should be adopted in switchrooms to prevent fire (ELECTRICAL REVIEW, August 21st, 1936) did not deal specifically with the reliability of circuit-breakers, and as this reliability is a fundamental starting point in the whole problem of safety, the report may be regarded as a summary of recommendations to deal with situations when the circuit-breaker has failed. If one were permitted to write a preface to the report it would be in the terms that all circuit-breakers should have their rupturing capacity proved by tests over the full range of faults which may occur.

The supply industry now recognises this important fundamental and the majority of switchgear specifications issued insist on the submission of authentic rupturing-capacity test data. This is a pleasing contrast to what obtained a few years ago, when reference to such data in specifications was exceptional, and it reflects credit on those manufacturers who have provided the necessary research facilities and high-power testing plants.

Taking the basic principle of circuit-breaker reliability for granted, it is of further significance that the Committee should deal with insulation problems under item 1 of its recommendations. It is known that insulation which may satisfactorily withstand B.S.S. test pressures prior to installation may break down after several years' service. This deterioration in insulation over a period of time may be due either to surfaces exposed to the atmosphere, or to internal deterioration of the insulation itself. Periodic pressure testing can in the main reveal faulty insulators, particularly where surface deterioration has taken place. The suggestion as to periodic pressure testing, however, needs careful examination, as such tests can hasten deterioration of insulators by repeated over-stressing. Such tests should have a definite limit, both in pressure and time of application.

A more difficult problem relates to internal deterioration of insulation, as, for example, condenser layers in a bakelite bushing. In this case periodic power-factor tests for high-voltage gear and possibly "Megger" tests for low-voltage gear would be necessary to detect deterioration. It is not a question of the power-factor percentage, but of the change in power-factor over a period in the insulation life.

Typical 11,000-V, 150,000-kVA light metal-clad unit having front, side and rear division screens, and (right) 33,000-V, 500,000-kVA single bus-bar metal-clad unit showing fire-proof division screens



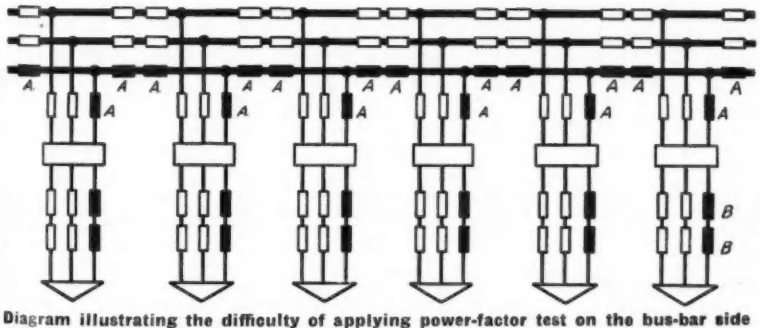
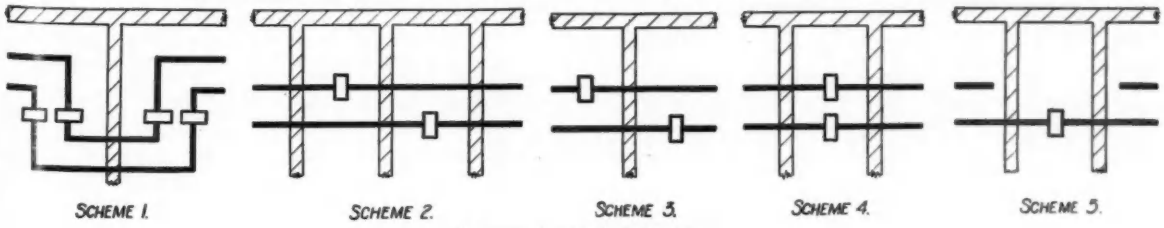


Diagram illustrating the difficulty of applying power-factor test on the bus-bar side of circuit-breaker. Bushings A, bus-bar side, all in parallel on each phase during test; bushings B, limited in number

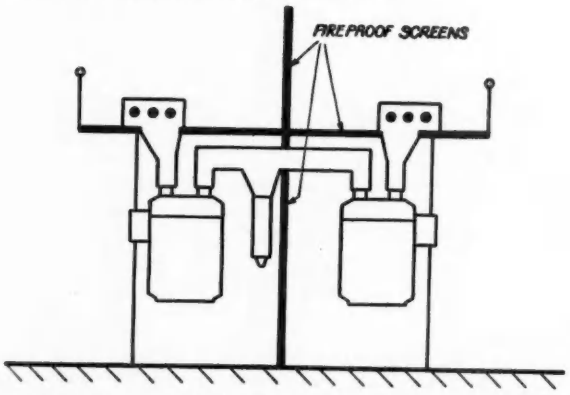
The power-factors of two bushings taken from one consignment may vary over a range of 2 to 1 and yet both bushings be equally healthy; for example, bushing (*a*) may have an initial power factor of, say, 2 per cent., and bushing (*b*) 1 per cent., but after a number of years bushing (*a*) may have a power factor of 2.2 per cent., and bushing (*b*) 2.1 per cent., which would show bushing (*b*) to have suffered more deterioration even though its power factor was less than bushing (*a*). The difficulty of obtaining information of value from power-factor tests lies in the fact that a large number of insulators are often connected in parallel and it is impossible to ascertain whether a measured change in power-factor is due to a slight change in all the insulators or a large change in one.

A test may be more successful on the circuit side of the breaker due to the reduced number of insulators, but unfortunately on the bus-bar side the large number of insulators connected in parallel minimises the value of the periodic power-factor test. The difficulty of conducting satisfactory tests to check deterioration makes it imperative that the standard of bus-bar insulation should be as high as possible and that the complete bus-bar system should be brought within the protected zone of the circuit-breakers. This emphasis of the importance of insulation underlines further the necessity of reducing to a minimum the number of insulators in a switching installation.



Schemes for sectionalisation

Allied to the importance of the insulation and protection of bus-bars is the segregation of each bus-bar group in order to localise the disturbance on the occurrence of a switchgear fault. The sectionalisation of switchgear and the housing of each section in a separate fireproof chamber is characteristic of modern switchgear installation, but a more subtle problem arises in interconnecting these sections.



Sectional view of metal-clad unit with duplicate breakers and with fire-screen divisions between bus-bars and between breakers

The section switch is the vital switch when a major switching disaster occurs and it should be capable of being operated in safety to isolate a faulty section. Furthermore, safe access must be provided to the section switch rooms in the event of the necessity of operating the section switches by hand. This may not be possible if the section switch is housed in the same room as the main gear. Moreover, if housed in a separate room a fault on the section switch may involve both sections and result in a total shut-down. The following schemes have been adopted, the relative merits of which must be balanced against the additional cost of switchgear and/or buildings.

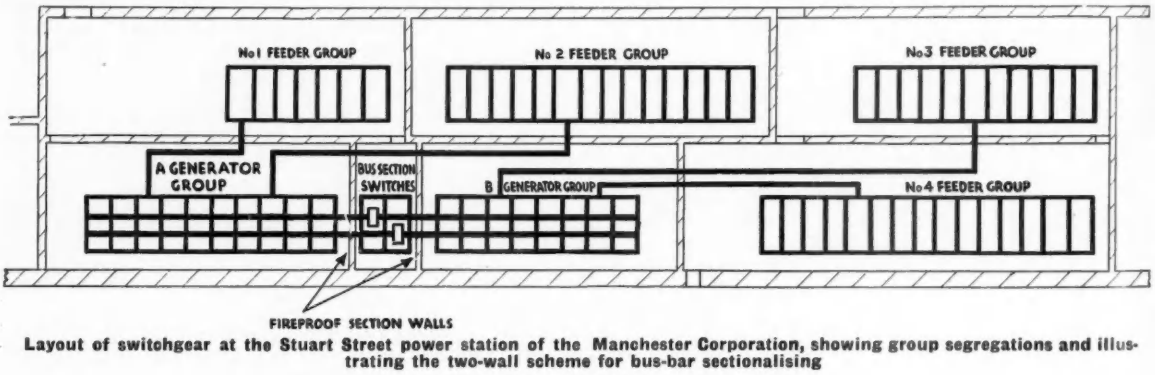
Scheme 1. *Duplicate bus-bars employing one division wall and two breakers in series for sectionalising.*—This scheme is probably ideal for large power stations in that each section has its own switch for cutting off a faulty section; hence a fault in room (a) involving section switch (a) still leaves section switch (b) in room (b) to break the sections apart. Whether the two switches in series should be extended to cover both bus-bars is a matter of cost and switching flexibility.

Scheme 2. *Duplicate bus-bars employing three division walls and two section switches, one in each bus-bar.*—The section switches are housed in separate fireproof rooms and are thus kept apart from each other and from the main sections of the switchgear. By this means a fire in any of the chambers is confined to that particular chamber. For instance, a fault on one section switch does not prevent operation of the other section switch. An objection to this scheme is that three fireproof walls are necessary, with the attendant disadvantage of fireproof doors. The scheme does not possess the advantages of scheme 1, as a fault on one section switch may involve the three sections of bus-bars which are brought together in that compartment.

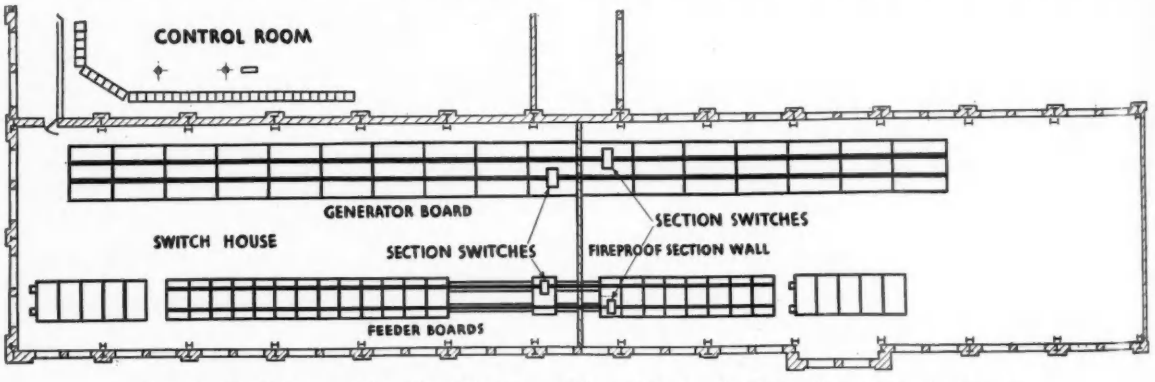
Scheme 3. *Duplicate bus-bars employing two division walls and two section switches, one in each bus-bar.*—This scheme differs from scheme 2 in that no division wall is arranged between the two section switches. The section switches remain accessible for operation in the event of fire in either of the main switch rooms, but a fault on one section switch may involve four sections of bus-bars, as the four sets of bars are brought into one compartment.

Scheme 4. *Duplicate bus-bars employing one division wall and two section switches, one on each bus-bar.*—This scheme makes for economy in building cost, but has the disadvantage that a fault in one main switch room may involve the section switch in that room. It would not, however, interfere with the operation of the section switch in the second set of bus-bars in the other room. It is difficult to assess the relative merits of schemes 3 and 4, as in scheme 3 a major disaster in most cases would not affect the section switches, whereas in scheme 4 one section switch would be involved. On the other hand, a major disaster to a section switch in scheme 3 would involve the complete station, while a corresponding disaster in scheme 4 would leave one section still healthy.

Scheme 5. *Duplicate bus-bars employing two division walls and one section switch in one set of bus-bars only.*—In this scheme the reserve bus-bars are permanently divided and the section switch is in one set of bus-bars only. This arrangement is probably to be preferred to schemes 3 and 4 where the main set of bus-bars is constantly in use and the reserve set of bus-bars used in rare emergency cases. The value of this scheme is that in the event of fire on one section the section switch is accessible for operation to isolate the remaining section; alternatively in the event of disaster to the section switch both sets of reserve bus-bars in the station are unaffected.



Layout of switchgear at the Stuart Street power station of the Manchester Corporation, showing group segregations and illustrating the two-wall scheme for bus-bar sectionalising



Layout of switchgear at the Kirkstall power station of the Leeds Corporation (one-wall scheme)

The above schemes have dealt with the cross sectionalisation of bus-bars, but something must be said for the separation by means of fireproof walls of the main and reserve bus-bars throughout the length of the gear. Here cost, both of switchgear and building, is a considerable factor, as the complete separation of bus-bars necessitates switchgear employing two

School Heating in Norway. By Svend Anker-Rasmussen

An elaborate electrical installation

SOME time ago the board of the Oslo municipal power works, acting on the advice of their technical director, decided to experiment in large-scale electric heating. Among the schemes was one at the Foss school. The total floor area of the main building, which is of three storeys with a large basement and attic, is 4,621 sq. m. and the volume 17,777 c.m. The installation totals 251.85 kW, an average of 14.2 W per cu. m. The new heating system was tried out for the first time in March last year, though the installation was not quite completed until the beginning of July. The consumption of power amounted to 86,400 kWh in March and 30,900 kWh in April, the average temperature of the months in Oslo being 0.56 and 4.56 deg. C., respectively. The system during these two months was chiefly operated by hand regulation, but a special automatic heat control system has now been installed in the Foss school. The consumption is estimated by the suppliers of the radiators to aggregate 300,000 kWh for a whole heating season.

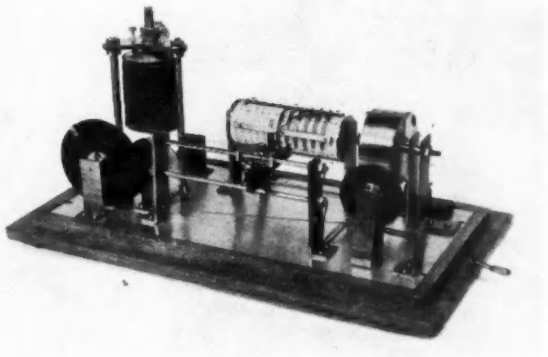
This picture shows the installation in a classroom, with 900-W panel heaters under the windows and 1,000- and 1,200-W radiators near the ceiling. The room is equipped with impulse switchgear placed in a wooden box on the wall between the first and second window from the left. The "feeler" is hanging from the ceiling in the middle of the room

The installation in the classrooms comprises low-temperature panel heaters under the windows and high-temperature (glowing) heaters near the ceiling. The panel type are to compensate for the building's heat losses, while the others are switched on between lessons. The electric heaters deliver the major part of their effect in radiant heat and the smaller part by convection. The advantage of this arrangement is that a lower and more convenient temperature can be maintained.

The daily variations of temperature in the classrooms are controlled by a "feeler" that reacts equally well to radiant heat and convection. It consists of a closed receptacle filled with a volatile fluid. By means of a little resistance heater under the receptacle the latter is kept always at about 24 deg. C. Variations of the conditions in the room alters the pressure of the vapour in the receptacle. This affects a pile of carbon discs, resulting in variations of the ohmic series resistance over the discs. The resistance is coupled to a Ferrari motor, the rotation speed of which thus varies according to the variations of resistance. By means of a stage-switch these impulses are then transmitted to the main switchboard from which the installation is partially switched on and off according to the demand. The installation in each classroom is divided into four stages, one for each half of the radiators and convectors. The power is thus never switched on or off instantaneously, the order being first one half of the convectors, then one half of the radiators, and then the remainder in the same order.

In addition the Foss system includes "impulse" switching arrangement that governs the time when the heat is to be switched on in the morning and off at noon-time. This device consists of a switch arrangement operated by clockwork. A number of metal rings are fastened on a cylinder in such a way that they form the cooling-off curve characteristic of the building. By the rotation of the cylinder this arrangement of rings is brought into contact with a set of springs giving impulses to a governor-relay which operates the stage-switchgear. A metal wing for the closing down of the whole plant is also mounted on the cylinder. The wing can be fixed as wanted and gives, *via* a set of contact springs on the rear side of the cylinder, the necessary "out" impulse to the governor-relay. The construction of the cylinder is such that the curve form can easily be adapted to the characteristics of any other building. On the left side of the "impulse" switch is mounted an extremely sensitive thermo-regulator. In case of temperature variations in the room, contractions or expansions occur in the regulator and these are mechanically transmitted to wheels in front of the device. Between the wheels is mounted a cord which is fastened to the set of contact springs. This set is thus subjected to horizontal movements which cause the whole plant to be switched on earlier or later than normally.

When the school is not in use the whole heating plant is automatically closed down, as the time-switch of the automatic switching apparatus will have given its "off" impulse to the governor-relay. In case of weather conditions changing during the winter, the heat is not switched on before it is absolutely necessary, the correct time being indicated by the thermo-regulator. If temperature changes take place during day hours, the "feeler" together with the stage-switch ensure that only the strictly necessary amount of power is switched on at any time. Over-heating is thus effectively avoided and much money is saved. The automatic control system was designed by Mr. A. Hals, of Trondhjem. It has proved, in practice, to be entirely up to expectations.



The "impulse" switching equipment. The cylinder with the curve arrangement is seen in the middle of the apparatus, the clockwork being placed in the drum on the right. The thermo-regulator is seen on the extreme left and the cord which operates the horizontal movement of the set of contact springs is in the foreground. The whole device is enclosed in a box and the clockwork which drives the mechanism is wound once a fortnight

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Switchgear Fire Risks (*Continued from preceding page*)

separate circuit-breakers per unit. In spite of the cost, physical separation of the bus-bars in this manner merits serious consideration for large power station switchgear.

While major consideration must be given to the satisfactory sectionalisation of the main groups of bus-bars, disturbances can be further localised by careful design of each circuit-breaker unit. In the early stages of development of heavy metal-clad switchgear the use of castings led to side frames and pedestals of open construction and no obstruction was thus provided to the spread of fire and oil from one end of the board to the other. Modern fabricated construction has enabled side and in some cases rear screens to be used for enclosing the circuit-breaker, which is virtually in its own cell in each equipment, thus effectively localising any disturbance in the region of the breaker.

The Committee's report states that control cables should not be run in proximity to main cables. It is equally vital that the control cables themselves should be sectionalised to correspond with the switchgear; that is, the control cables for, say, section 1 should not pass through section 2 switch chamber. Furthermore, the control cables for the section switches should be kept clear of the remaining switch rooms. All the control cables converge at the control room end, the important point being that they should be kept apart where they are liable to damage, *i.e.*, in the main switch rooms.

My thanks are due to Manchester Corporation, Leeds Corporation and Ferguson Pailin, Ltd., for the illustrations included in this article.

Public Utility Finance. By H. G. Howard, M.I.E.E.*

The question of depreciation and general reserves

THE busy executive of a public utility does not usually worry much about any formula or rule to guide him in the building up of reserves, he contributes what can be spared from the revenues. It is more often the case that the consumer or the authority responsible for safeguarding the consumers' interests is much more concerned with the reserve policy and the accumulation than the company. The principles upon which contributions to reserve funds should be based are generally agreed upon and may be summarised as follows:—

(*a*) To ensure that the shareholders' investment is not impaired.
(*b*) To provide for important renewals not covered by ordinary maintenance.
(*c*) To provide for extraordinary repairs and maintenance due to storms, strikes, and other abnormal causes, for dividend equalisation, extra taxation, working capital, losses due to higher prices, unforeseen contingencies, &c.
(*d*) To write off all non-tangible assets such as preliminary expenses, goodwill, &c.
(*e*) To provide a sinking fund to pay off debentures and loans.

To provide adequately for (*a*) a sum should be accumulated which will compensate for depreciation due to physical deterioration, obsolescence and inadequacy. Should this sum represent the original cost? I think it should. It is the investment which has to be kept intact, but allowance should be made for any debenture issue and sinking fund when calculating the annual contribution to a depreciation reserve. In other words, the theoretical contribution to depreciation might be reduced by the whole or part of the sinking fund provision, depending on the nature of the debenture issue.

Should this contribution be made by means of (i) a percentage on the gross or net revenue, (ii) the "straight line," or (iii) "sinking fund" methods? A policy which aims at an average contribution to the reserve funds over a period of years is probably the most convenient to adopt. One large firm of investment bankers in London, when comparing the comparative financial merits of electricity supply undertakings, reduces them all to a similar basis and allows an average annual contribution to depreciation and renewals reserve of 3½ per cent. on the investment, this amount being in the firm's opinion a fair one. Nash (referred to later) gives 3.025 per cent. by mathematical computation of a hypothetical case of a property with normal growth.

The Development Period

Contributions cannot always be restricted to a definite percentage annually but have to depend upon the revenue earned. Prosperous years should permit a larger provision than the lean years. The average public utility, however, fails to earn sufficient in the first few years of its existence to allow a fair return on the investment and at the same time provide enough for depreciation and renewals. Reduced contributions and, in some cases none, can therefore fairly be permitted during the development period provided that over a period of years the average contribution aimed at is maintained. For thermal-electric undertakings the development period under normal conditions and good management should not normally exceed three years; for hydro-electric properties and large non-generating transmission and distribution systems where the fixed charges are heavy and form the principal production cost, five years ought to suffice.

To provide for depreciation as included in (*a*) the straight line method would appear the more practicable for thermal-electric supply undertakings. It is usual to invest such reserves in the business and interest is rarely allowed on them. It would convey a better indication of the financial state of the undertaking if the same interest rate as that distributed to the ordinary shareholders could be applied to the invested reserves and credited to the depreciation fund. It is presumed that the annual provision for depreciation reserve would be decreased by the amount of the interest, so that the interests of both consumer and shareholder would be unchanged. If the depreciation fund is large, it is desirable that a proportion, possibly not exceeding 10 per cent., be invested outside the business in trustee securities.

For large hydro-electric and transmission systems where the fixed charges are high, physical deterioration slower, and actual operation expenses low, the sinking fund method is possibly preferable, provided that the fund is split up into parts which mature in different years and that a liquid renewal fund is maintained for current small retirements and expenses. For reasons stated later it will be found in practice that an annual contribution based upon (*a*) will be ample to provide for the renewals, &c., contemplated in (*b*) provided that a small percentage of the fund is invested outside the business.

A general reserve is undoubtedly necessary for miscellaneous contingencies and the amount will vary widely with local conditions, being generally higher abroad than in England. What would constitute a reasonable annual contribution must be left to the judgment of the executive and based upon accepted good practice. An annual contribution not exceeding 1 per cent. of the investment to accumulate to a sum of not less than 10 or more than 15 per cent. of the investment is suggested.

For dealing with preliminary expenses, non-tangible assets, &c., the sinking fund method would appear to be the best means of writing off such capital. With normal growth of the average undertaking the strict application of the straight line or, to a lesser extent, the sinking fund method becomes increasingly difficult and complicated. A complete study and inventory, at least every two years, is necessary with the average contribution modified to conform to the increased investment, prevailing interest rates, prices, &c. A better guide would appear to be to aim at accumulating the reserves to an amount equivalent to a percentage of the investment. This is of great importance to shareholder and consumer. In this connection we are concerned only with (*a*) and (*c*) as the other items have obviously to be accumulated to maturity. Public utility economists are generally in agreement that if the straight line method of computing depreciation reserve contributions, based upon "useful lives" is adopted, an unnecessarily large fund is ultimately accumulated.

Shareholders' and Consumers' Interests

Public utilities may be described as monopolies benevolently protected by the State but with important responsibilities to the public. Their licences or franchises are usually for long periods, subject to renewal, but, if not, a purchase condition fair to the shareholders is generally included. In rare cases only would the whole of the calculated depreciation reserve be needed. Owing to the physical diversity factor of an undertaking it has been found by experience that when a depreciation and renewal fund has been accumulated to a liberal percentage of the investment and retained at that figure by replacing all withdrawals from the fund by contributions from revenue, the shareholders' interests are amply protected and the consumer benefited by the succeeding smaller contributions to the fund. This percentage must vary obviously for different properties but should be lower for the larger properties than the smaller ones, owing to the larger physical diversity factor of the former.

An important point in assessing the amount of the reserve is the maintenance policy of the company. If this has been liberal then the amount may be lower. I cannot do better possibly than to quote an extract from the "Economics of Public Utilities" by Nash, as follows:—

> "Many experienced public utility operators have come to the conclusion that a reserve amounting to not more than 10 per cent. of the investment in the property is sufficient to take care of the retirement needs of the present and near future and that a reserve of 20 per cent. for such an investment is a liberal provision by a prosperous company for anticipated future requirements and contingencies under reasonably stable and normal conditions."

I have deliberately quoted an American authority as more attention has been paid to the regulation and valuation of public utilities in that country during the past twenty-five years than in England. There is also a difference between retirement and depreciation. A unit of the assets of a company might be retired but never replaced. Retirement reserves may thus be less than those for depreciation. If the above limiting percentages are taken as authoritative it would appear that a liberal general reserve fund would be also necessary.

Examples of British-owned and managed undertakings gave the following percentages. The figures are approximated; capital does not include investment of reserve funds:—

Company.	Paid up capital.	Reserves.		Percentage to capital.		1935 Contr. per cent.	
		Depr. only.	Total.	Depr. only.	Total.	Depr. only.	Total.
	£	£	£				
1. India and Burma	1,000,000	438,000	671,800	44	67	5.7	—
2. South America ...	625,000	342,500	342,500	55	55	—	—
3. India and Burma	240,000	91,300	91,300	38	38	2.0	2.0
4. Africa*	845,000	86,400	197,200	10	25	—	—
5. Southern England†	16,500,000	3,407,000	6,000,000	20	35	3.8	—
6. " " ...	5,000,000	2,470,000	2,750,000	49	52	—	7.4
7. Northern England	2,200,000	250,000	652,000	11	30	2.3	—
8. " " ...	4,670,000	1,375,000	1,470,000	26	30	4.5	—
9. India	1,050,000	370,000	528,000	35	50	4.9	5.7
9 (*a*). India (with invested reserves)	1,376,000	370,000	528,000	27	39	3.6	4.4

* Started in 1925. † Regulated company.

* Chief Engineer for Electricity, Madras Government.

Details are not available, except in the case of item 9, to determine what proportion of the accumulated reserves have been invested in each property.

From the preceding arguments and a study of the above figures it would appear reasonable to limit the accrued reserves to a maximum total of 40 per cent. of the investment. Higher figures would indicate that the tariffs were too high and should not be permitted unless justified by special conditions. Depreciation reserve fund might be fixed at from 20 to 30 per cent. and the general reserve from 10 to 15 per cent. of the investment.

The contribution to reserves is possibly more a matter of executive than of accounting responsibility, and we must therefore conclude that no firm rules can be laid down for the private company—sound business judgment is the primary requisite.

As a rule it is only when a case of valuation or modification in the tariffs by State authorities arises that certain assumptions regarding reserves have to be made. On the other hand State managed undertakings have from their very nature to be subjected to uniform control and regulations. It would, perhaps, be desirable to apply such control to municipal undertakings also when the variety of the financial policies followed by such bodies is considered.

What is a Fair Return

The question of fair return and management and production expenses have also to be considered. In England a fair return has already been laid down as 7 per cent. for some large undertakings and 8 per cent. in the case of distribution companies.

Sometimes participation of the shareholders and the consumers in profits on a sliding scale in excess of those percentages may be permitted. Due to the present low rate of interest it is probable that the percentage limits will be reduced for new enterprises. Abroad, particularly in the East, a similar return plus 1 per cent. and free of income tax for the additional risk and expense involved, would not be unreasonable. Management and production costs vary so widely, according to the nature of the undertaking and its situation, that each case has to be studied on its merits and with particular reference to local conditions.

To summarise, I would be inclined in an examination of public utility undertakings which are stable and have reached maturity, operating outside the British Isles but within the Empire, to fix the average annual contribution to, and limit of accumulation of, reserves as follows:—

	Thermal-electric undertakings.		Hydro-electric and transmission system.	
	Per cent.		Per cent.	
	Annual.	Ultimate limit.	Annual.	Ultimate limit.
(*a*) Depreciation and renewals ...	3—4	20—30	2—2½	15—25
(*b*) General reserve	1—2	10—15	1—1½	5—10

(*a*) To include sinking fund for any debentures and a small liquid renewal fund mainly for obsolescence.

(*a*) and (*b*) together not to exceed 5 per cent. of the investment annually in the case of thermal-electric undertakings and 4 per cent. in the case of hydro-electric and transmission systems. Accumulated reserves not to exceed 40 per cent. of the investment in the case of thermal-electric stations and 30 per cent. in the case of hydro-electric and transmission lines.

State managed electricity undertakings are controlled to a variable extent by rules and regulations which may result in a somewhat mechanical form of administration and leave little scope for the exercise of commercial judgment. The order in which the gross revenue of such undertakings as far as available, might be distributed, is suggested as follows:

(i) Complete production costs, including operation, maintenance and management.
(ii) Interest on loans and debentures.
(iii) Contribution to a sinking fund for the repayment of loans and debentures not to exceed 2 per cent. of the invested capital.
(iv) Contribution to a depreciation reserve not exceeding 4 per cent. of the investment. (Items (iii) and (iv) taken together not to exceed 5 per cent. of the investment.)
(v) Contribution to a general reserve not exceeding 1 per cent. of the investment.
(vi) Contribution not exceeding 2 per cent. of the investment to be utilised for any purpose which the State or municipal council might wish.
(vii) Surplus to be devoted to the reduction of electricity rates, improved street lighting, and for electrical development in general.

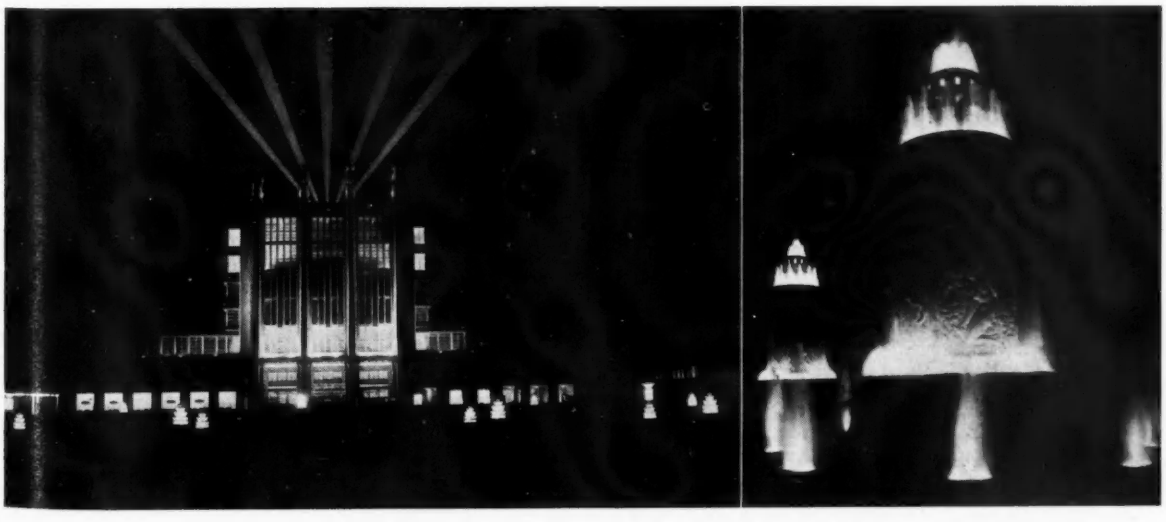
For large State hydro-electric and transmission systems, the allocations might well be reduced as follows:—

(iii) For 2 per cent., substitute 1½ per cent.
(iv) „ 4 „ „ 2½ „
and for 5 per cent. read 4 per cent.
(v) Could stand.
(vi) The surplus might be divided in the proportion of 60 per cent. to the consumer and 40 per cent. to the State.

This subject is of interest as there are indications at present of a tendency for the State to assume gradually an increasing control over the administration of public utilities.

Continental Decorative Lighting

TWO new fountains which are floodlighted at night have recently been completed at the Port de Saint Cloud in Paris. The installation is the largest of its type in France, and has a motor-driven pump with a capacity of 105 gallons per second. This has to be raised to the top of the fountain for the upper row of nozzles, a height of over 57 ft. above the level of the pumps. The pumps are placed in a chamber underneath the fountains, in which the controls for the lighting are also placed. The fountains are lighted by 112 projectors placed in watertight casings in the fountain itself, so that the water serves constantly to cool them. Pumps and lamps are controlled by an electric clock system, which turns on the fountains on the desired days and at the desired time. The installation is provided with safety locking devices which open the main switch, turning off pumps and lamps in case of serious leakage of water or of overheating of the pump motors. Moreover, the lighting cannot be switched on if the fountains are not playing, so that overheating of the projectors is avoided.



Left: The exterior of the Grand Palais du Centenaire, Brussels, illuminated for the recent Motor Show. Right: Floodlighted fountains at Port de Saint Cloud, Paris

At the Brussels Motor Show, which closed this week, some excellent examples of interior and exterior lighting were to be seen. A feature of the inside arrangements was an avenue of tall illuminated pylons. The exterior was also brilliantly lighted, as our left-hand illustration shows.

Meetings and Discussions

Compulsory wiring rules and registration of contractors are recommended by an A.S.E.E. Committee which presented a paper this week at a meeting of the Association. At yesterday's I.E.E. meeting Mr. J. O. Knowles read a paper on motor control gear. Mines inspectors took part in a discussion on colliery lighting introduced by Mr. J. W. Howell at a gathering of the Illuminating Engineering Society last week. A practical paper on high-voltage d.c. testing was presented before the London Technical Group of the E.P.E.A. on January 12th by Mr. F. Stretton Smith

An Installations Board

IN April, 1936, the Executive Council of the ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS appointed Messrs. S. B. Donkin (chairman), J. M. Crowdy, Alan Kirk and J. Munro to examine the general question of compulsory wiring regulations and registration for the electrical installation industry. Following their inquiries, these gentlemen have prepared a paper on the subject which is being read at meetings of the Association (in London on January 19th).

The paper first states the reasons for suggesting the necessity for legislation to apply to all parties concerned. Next a suggested scheme for this country is outlined. Finally, appendices deal with the extent to which registration has been adopted in other industries and professions in this country, and the application of compulsory registration and/or licensing to electrical installation work in the British Dominions.

The scheme has not been worked out in detail, but, in outline, suggests that powers should be given to the Electricity Commissioners to establish a Board, which should fully represent all interested parties It is suggested that in any case the Electricity Commissioners, Central Electricity Board, and Home Office should be represented, and it is thought that representation will also be desirable from the Institution of Electrical Engineers, the insurance companies, the British Standards Institution, and the employers and employés of the supply, manufacturing and contracting sections of the industry.

The Board should have powers to (*a*) register and issue licences to contractors and operatives (the latter to include all persons engaged on installation work and supervisory and maintenance employés) subject to annual approval; and provide a system of examination, both practical and theoretical, for operatives and, if necessary, for contractors. (*b*) Provide for inspectors, for which the Electricity Commissioners already have powers, and control their activities to ensure that installation work shall conform to a given standard and to the regulations. (*c*) Issue regulations stipulating, *inter alia*, that no person may carry out installation work unless registered and licensed; that present and other regulations shall be strictly enforced; that no installation shall be permanently connected until certified as satisfactory by the Board.

(*d*) Establish a scheme whereby all electrical materials, cables, fittings and apparatus may not be marketed or used unless they conform to approved standards; and to arrange that all manufacturers shall be licensed by the British Standards Institution, or the proposed Board, to ensure that the goods made by them shall comply with appropriate specifications and bear a B.S.I. mark as a guarantee of compliance, such compliance to be ascertained on site by the proposed inspectors.

If the proposals are ultimately realised, it may be desirable to provide for the issue of provisional licences in specially qualified cases during the interim period while the new system of control is gradually being put into operation.

Following discussion of the present A.S.E.E. paper it is suggested that the I.E.E. might convene a conference to resolve that the scheme, wholly or in part, shall be proceeded with. The I.E.E. could then, with the goodwill and weight of the industry behind it, make detailed recommendations to the Minister of Transport, so facilitating the passing of any necessary Act of Parliament.

Emergency Lighting Systems

AT an informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS in London on January 11th Mr. E. Ridley explained that provision of precautionary measures against the failure of illumination was the rule in theatres and public halls forty years or more ago. It was highly desirable that semi-public buildings and large stores should also provide for emergency lighting. The additional cost was small when the valuable security against panic it afforded was considered. The ideal emergency system was undoubtedly a unit self-contained on the premises.

After mentioning certain provisions in the Home Office Regulations for Cinematographs of 1909, Mr. Ridley said that so far as entertainment buildings were concerned the emergency system was generally required by statute, but with regard to hospitals and nursing homes there was no compulsion, though many operating theatres had a standby of some sort which was frequently a battery mounted on a trolley. A new development consisted of emergency lights controlled by a solenoid maintained by the supply undertaking; on the interruption of the main supply the solenoid operated and the secondary system was switched in.

Some contributions to the discussion dealt with the variety of by-laws issued by local authorities and it was suggested that these should be standardised. In this connection Mr. Ridley pointed out that conditions varied considerably. The operating theatres of some provincial hospitals and of many nursing homes might only be in use for a few hours a week, while a theatre that had a 12-hour battery in reserve had obviously a much stronger position than one with, say, a 45-minute battery.

The L.C.C. Regulations permitted the carrying-on of an entertainment by means of the emergency lighting, but did not allow the re-opening of halls until alternative systems of lighting were in being. Mr. Ridley thought it was the business of the manufacturers and of the entertainment interests to show the need for standardisation of regulations. If the B.S.I. were then approached, he felt sure something would be done.

Motor-circuit Protection

SOME of the practical considerations that determine technical decisions relative to the installation of motor control gear and sub-distribution switchgear are reviewed in the paper by Mr. J. O. Knowles (Brookhirst Switchgear, Ltd.) which was read before the INSTITUTION OF ELECTRICAL ENGINEERS in London on January 21st. These two sets of gear share the duties of isolating and protecting the machine circuits. Therefore, the author maintains, they should be considered in conjunction and their layout decided upon co-operatively.

It is becoming more common to consider the control of motors in groups rather than individually; say, for driving conveyors in sequence, multi-pump installations, multi-motor machine tools and boiler-house auxiliaries Various grouping arrangements are compared in the paper, and some of the advantages of 3,300 V motor circuits are stated.

Growth of the demand for remote operation and for frequent opening and closing of motor circuits accounts for the increasing use of contactors. This has brought their design into more prominence (see ELECTRICAL REVIEW, p. 43, July 13th, 1934) and emphasises the importance of further study of the process of making and breaking circuit by this means. The difference between opening a.c. and d.c. circuits is pointed out, the author stating that the distinction between the design of a.c. and d.c. contactors may be given still more weight in further research.

Motor control gear for frequent operation has been developed on the general basis of air-break contactors, while distribution circuit-breakers and hand-operated motor control gear are mainly of oil-immersed types. Research work in several countries has confirmed this practice, since endurance tests have shown more contact wear on oil-immersed switches than on air-break switches of equivalent design.

In contrast to the scale on which the rupturing capacity of transmission switchgear is being investigated, the author thinks the attention paid to short-circuit protection of motor and other industrial circuits is often far too cursory. He states that large short-circuit values can be almost always avoided on low-voltage networks if there is a will to do so, and if the basic idea of the layout includes this intention.

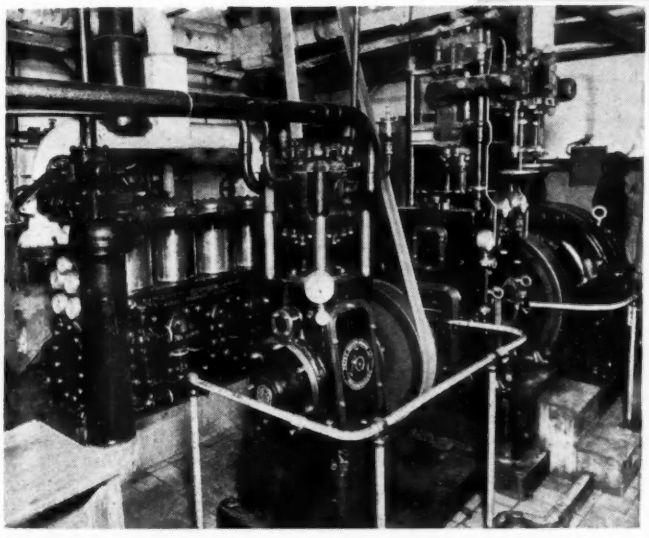
Insufficient use is often made in large installations of the choke effect of transformers on low-voltage short-circuit values. Installations grow up on low voltage, and the industrial engineer has need to borrow some of the point of view of the supply engineer who thinks in terms of high-voltage distribution with a number of low-voltage transformers each placed as close as possible to its section of the load and not usually larger than 500 kVA. Larger transformers involve heavier short-circuit values, and over 25,000 kVA very little generally is known of the performance of low-voltage switchgear or fuses. Larger sizes of transformers with 400 V secondaries also involve the use of greater currents than are convenient.

Compulsory registration
Motor control gear
High-voltage d.c. tests

Data available on the performance of wired fuses at a.c. short-circuit values of from 2,000 to 5,000 kVA are extremely scanty. The time of operation of high rupturing capacity fuses is so short that the risk of damage to the circuit protected must be extremely slight; in fact, small starters of the simplest type have been found to be in good working order after severe short-circuits when protected by such fuses, even though without such protection they would have been destroyed by the short-circuit power available.

As the size of fuse increases, the operating time increases for the same value of r.m.s. short-circuit current. It its quite possible for the main breaker to trip first on lesser short circuits and for the sub-circuit fuses to clear first on severe short-circuits (see ELECTRICAL REVIEW, p. 79, January 15th, 1932).

As prevention is better than cure, the maintenance of high insulation values should be to the electrical engineer as much a matter of routine as good lubrication is to the mechanical engineer (see ELECTRICAL REVIEW, p. 804, June 3rd, 1932). The cost of fitting or applying apparatus to indicate the state of the insulation should be proportionate to the risk to be guarded against. It is not sufficient to test a large group of motor circuits and, further, it will be necessary to distinguish between leakage currents (of the order of 1 mA, corresponding to 0.2 megohm at 200 V) and capacitance currents across the insulation, which may be of a higher order.



Nevertheless, the problem of providing visible indication in each motor circuit (or in selected important motor circuits) of the safe or dangerous insulation value of the insulation in that circuit can be solved, and if the avoidance of short-circuits by very sensitive leakage indication or ultra-sensitive leakage tripping becomes generally desired in motor circuits, the author suggests that the cost can be brought down by further development.

High-voltage d.c. Testing

A PAPER read before the London Technical Group of the ELECTRICAL POWER ENGINEERS ASSOCIATION on January 12th, by Mr. F. Stretton Smith (Callender's Cable and Construction Co., Ltd.), commenced with a reference to the various types of high voltage rectifiers used in cable testing equipments. The second part dealt with modern methods of carrying out acceptance tests and fault localisation on new installations of cable and overhead line.

It was contended that d.c. was as effective as a.c. in finding defects, and that d.c. tests were more readily carried out owing to the portable nature of the testing equipment. The various types of faults which might be expected were discussed and two methods of high voltage location referred to, the first, comprising the h.v. Murray loop test, and the second a newer method for locating intermittent flashing faults by means of a special instrument called the Gooding flash-meter.

It was also shown that it was often possible to predict the cause of a failure on acceptance test from the manner in which the breakdown took place.

The most interesting section of the paper was the part dealing with routine d.c. tests on cable systems, which, said the author, differed from acceptance tests on a new cable because (1) a.c. was not satisfactory, (2) a considerably higher d.c. voltage must be used, and (3) the types of faults encountered might be quite different. The author was of the opinion that routine d.c. tests were effective and helpful in clearing incipient faults from cable systems, and advocated the testing of h.v. cables every year at a d.c. voltage of at least five times the a.c. working voltage. Various types of incipient faults were discussed and examples of actual tests carried out on old cables were given, showing that a feeder could be maintained practically free from service faults by systematic routine

[*Elec. Rev. photos.*

The new open-air ice-skating rink at Wembley of Alpine Rinks, Ltd. An all-the-year load is thus found for refrigerating plant formerly used only in summer to meet the requirements of the catering trade

testing. An a.c. test, he said, was of little value and awkward.

A test at ten times the a.c. working voltage would be more effective, but would cause the failure of imperfect joints which would normally function in service for many years. Trouble might also be experienced with the terminating switchgear. On belted type cable systems it was desirable to test between cores as well as to earth, and the duration of each test should be about five minutes. The author gave suggested minimum tests in tabular form to be carried out at least once a year.

The last part of the paper dealt with tests in the laboratory.

In the discussion Mr. W. H. Speedy asked whether incipient faults in metalclad compound-filled switchgear could be detected and the author replied that the d.c. test would be effective.

In answer to Mr. R. D. F. Parr, Mr. Smith said he had not meant to convey that the period of earthing should be the same as the period of the test. In a 33-kV cable the main charge would be dissipated in about three minutes, but there would still be a slight building up and it was advisable to earth for a period of an hour or so. It was not necessary to earth for 24 hours unless the test had been very long. Tests had been carried out over a period of a week or more, and in such cases a longer time would be required to dissipate the whole charge.

The chairman (Mr. A. M. Bennett) referred to a 60,000 V cable which had been tested, after which the cores were earthed for about five minutes. Seven or eight minutes after the earthing period one of the men had received a shock. Therefore, the speaker suggested that it was advisable to maintain the earth as long as possible. Mr. F. H. Sharp said that there was more unanimity of view nowadays with regard to d.c. routine testing and he believed that before very long specifications would call for tests at the end of the maintenance period, or possibly half way through the maintenance period, in order to give the purchaser some idea that the cable was still in good condition and was not deteriorating. The author said it was well recognised that a fault in the middle of a cable to start with, might be followed by a failure at the near end and perhaps also at the far end. Those again might give rise to further failures.

Mr. S. A. Stevens, commenting on the reluctance to subject switchgear to high-voltage d.c. tests, said he found it difficult to appreciate what there was to be afraid of, apart from condenser bushes. The investigation of what happened under d.c. pressure testing indicated that by skilful designing one

could so shape and proportion the job as to render it capable of withstanding the necessary pressures.

Mr. G. M. S. Sichel welcomed the reduction in the size and weight of testing apparatus. The d.c. testing gear nowadays could be carried on a light van or lorry. Although the author had suggested that a cable could without detriment be dead earthed at once, without using a resistance, the opposite view had been expressed by some engineers. Several power stations in this country had installed permanent high-voltage testing gear.

The author said that for discharging he used a special paper impregnated with carbon, and the resistance could be built up to the desired value. When discharging cables of very high voltages, great care should be taken to use a resistance of the correct value, so that it did not burn up as the result of excessive current passing through it. It was advisable always to discharge a cable slowly owing to the surge which was propagated through the connection at the test end. He believed it was common in the United States and on the Continent for power stations to have permanent testing equipment and it seemed that that practice should be followed in this country.

Colliery Lighting

AT a meeting of the ILLUMINATING ENGINEERING SOCIETY in London on January 12th a paper entitled "Some Important Considerations in Colliery Lighting" was read by Mr. J. W. Howell. A good many facts and figures were given by the author who, among other things, mentioned the possible use of electric-discharge lighting at collieries.

In the subsequent discussion Mr. F. H. Wynne (Deputy Chief Inspector of Mines) said that 2 c.p. was the most that could be obtained with a hand lamp and that was a recent development. Colliery managers and owners were a little reluctant to adopt mains lighting. In a modern mechanised mine, at the coal face there was a coal-cutting machine with trailing cable, and a conveyor also with some form of trailing cable, and if mains lighting were adopted there would have to be other cables and apparatus, all of which would need to be dismantled and fitted up again as the working face was developed, probably every twenty-four hours. There was also some suspicion of the possibility of sparks which might cause explosions. One did not know what the risk was, but the suspicion existed and there had not been sufficient experience to suggest that the risk was not there. The lighting of roadways was comparatively simple and an all-round improvement in lighting certainly would lead to better work and fewer accidents.

Mr. G. M. Harvey (Deputy Chief Electrical Inspector of Mines) remarked that the author had rather left the difficulties of mine lighting in the background, although he had dealt very effectively with the scientific side. There was, in the average mine, an extremely small space at the working face in which to accommodate cables and apparatus which also had to be moved quite frequently, and the great difficulty in that respect alone was the time wasted. In addition, in the case of shot firing the regulations at the moment provided that the lighting equipment, if any, should be withdrawn from the face or protected in such a manner that the cables and fittings could not be damaged by flying pieces of coal or stone. Another difficulty was the almost total absence of reflection at the coal face. Every fitting used for mains lighting was a potential source of danger, while the risk of falls of roof also had to be taken into account. Again, the body of the miner when at work very often obscured most of the light. All these disadvantages caused mine managements to hesitate to adopt mains lighting. Another consideration was that the mine management had to provide a miner with a portable lamp to enable him to get from the bottom of the shaft to his working place and it naturally desired, if possible, to make this answer the double purpose. When men had to leave their working places to get material of various kinds from less brilliantly lighted places they would suffer from what was called "lack of pit eye."

Mr. H. G. Batson said he was present a short time ago at an experiment in a northern mine when sodium lighting was used in the screening house and showed up the difference between shale and coal in a remarkable manner without in any way detracting from discrimination between hard and soft coal. A point in favour of these lamps was the small sizes in which they were available, namely, down to 50 W. The lamp used in the experiment he had mentioned was of 65 W, and it took the place of a 300-W incandescent lamp. He saw no reason why these lamps should not be contained in flameproof fittings, and, as there was sufficient mechanical robustness in the lamp itself to withstand the vibration of the screening plant, it might be mounted as an integral part of a coal-cutting machine at the coal face.

Mr. C. Hughes pointed out that it had been proved that the cold form of cathode lamp, while requiring high voltage, did not reach a dangerous temperature, and that in the event of the lamp itself being broken the temperature of the electrodes would not be sufficient to fire any gas there might be in the mine. A certain amount of work had already been done in developing such a unit for mine lighting at the face. A special gas-tight case incorporated the transformer for stepping up the voltage. The tube was of the mercury-argon type treated with a fluorescent powder to give some colour correction. The open circuit voltage was 500 to 600 V.

In answer to a query about mining regulations providing that the voltage of any system should not be more than 125 V, Mr. Hughes said experiments had actually been carried out in a mine and he had not heard of any trouble on that point.

The author, replying to the discussion, agreed that with the Mines Regulations forbidding any pressure above 125 V there would be some difficulty at present in employing the high-voltage mercury lamp underground.

Welding Pressure Vessels

THE use of the word "fusion" to distinguish certain welding processes is not always clearly understood. Therefore the paper by Mr. R. C. Young (Eagle Star and British Dominions Insurance Co., Ltd.), which was read before the BELFAST ASSOCIATION OF ENGINEERS on January 13th, commenced with an explanation that the term was merely a prefix denoting that the metal was welded, electrically or otherwise, in a molten or vaporous state without the application of mechanical pressure or blows.

The paper briefly described how steel pressure vessels were manufactured with the aid of automatic welding machines and then heat treated to relieve stresses. Reference was made to the importance of such factors as the speed of the machine, electrical input and type and size of electrodes employed, the author remarking that welding could not properly be attempted without some knowledge of the behaviour of the metal concerned.

He explained how welded seams were examined by X-rays and the use made of test plates, stating that proof of the confidence now placed in fusion welding for pressure vessels might be judged from the fact that Babcock & Wilcox, Ltd., had put into service over 100 welded boiler drums for pressures up to 700 lb. per sq. in., the first of which was supervised and tested by the author, who was at present similarly engaged on fusion-welded steam drums (five units for 700 lb. per sq. in.) for a total evaporation of 1,000,000 lb. of steam per hour.

Street Lighting.—In the course of a lecture delivered to a largely attended meeting of the JUNIOR INSTITUTION OF ENGINEERS in London on January 8th Mr. E. W. C. Day urged that, in selecting a street-lighting installation, the standard of visibility attained was an important factor, together with the faculty of colour discrimination and the proper placing of the lamp standards. Electric-discharge lamps embodied three essentials of great importance to good visibility on the road, namely, the eye was particularly sensitive to the yellow-green waveband of the spectrum; increased acuity of vision was gained by enhanced contrasts; and monochromatic light had the advantage of portraying sharp images due to the minimisation of aberration. To make a due comparison of different systems it was necessary that similar road surfaces from which the light was reflected should be seen under wet- and dry-weather conditions. He commended the Ministry of Transport's recommendation that the positioning of lamps should be studied with a view to securing the best visibility, rather than uniform spacing of the standards. With regard to the illumination of kerbs, the author favoured the "chequering" principle in which the kerb was coloured black and white in short alternate sections.

Synthetic Resins.—In a lecture delivered at the JUNIOR INSTITUTION OF ENGINEERS in London on January 15th, Mr. G. J. Taylor called attention to the constantly increasing applications of moulded articles composed of synthetic resins. One amber-coloured resinoid substance, he explained, which was soluble in school, acetone, and other organic solvents, had a melting point of about 120 deg. F., and was used mostly in the manufacture of insulating varnishes for impregnating coils to give rigidity and high insulation; after application of the varnish the coils must be heated slowly to a temperature of 120 to 130 deg. C. Cements also were made of this material for adhesive and bonding purposes, in both liquid and solid forms. In powder form with a "filler" this cement was largely used in capping electric lamps and radio valves. Laminated sheet consisted of superimposed layers of paper or fabric impregnated with synthetic resin varnish, the whole being subjected to heat and pressure to form a homogeneous mass. The temperature employed for hardening and curing was about 375 deg. F., and the pressure about 0.75 ton per sq. in. Various grades were made having different characteristics, some with high dielectric properties.

Radiant-heating Surface in Boilers. By "Entropy"

Its application to those of the natural-circulation water-tube type

THE use of radiant-heating surface in boiler practice has received much attention on account of its ability to absorb heat at a much greater rate than can normally be obtained with convection surface, unless the latter is applied in conjunction with an exceptionally high gas velocity. There can be no doubt that such is the case, but even so, the use of radiant heating surface in this aspect is limited, as its effectiveness is rapidly reduced with a falling gas temperature.

The rate of heat absorption by radiation is a function of the absolute temperatures of the two bodies raised to the fourth power, so that the rapid reduction in its effectiveness with a progressive reduction in gas temperature will be readily appreciated. In consequence, there is an economic limit to the use of radiant heating surface as considered from a thermal standpoint, and to achieve an acceptable stack temperature the use of convection heating surface is imperative.

The rate of heat absorption by convection is a function of the mean temperature difference of the two bodies which can be reasonably maintained with a progressively falling gas temperature by using, first, boiler water at saturation temperature, secondly, feed water at hotwell temperature and, thirdly, combustion air as the cooling mediums. In addition to the mean temperature difference of the two bodies, the rate of heat transfer by convection is dependent upon the gas velocity, and with convection surface an economic transfer rate may be assisted by variation in gas velocity which, of course, is impossible with radiant surface.

Advantages Resulting from its Use

One is therefore led to the conclusion that apart from thermal consideration good reasons exist for the installation of radiant-heating surface, the most outstanding being as a means of reducing furnace maintenance. The most modern combustion equipment can be operated with a very small quantity of excess air, which entails a very high furnace temperature, since the quantity of gas to be heated is relatively small. To promote the most efficient conditions of operation the introduction of the minimum amount of excess air is essential since this means minimising the gas weight and chimney loss, while the higher furnace temperature assists ignition of the fuel and consequently minimises combustion losses. These high furnace temperatures, however, impose severe conditions on the furnace walls and with coal firing frequently cause the inside face of the wall to be at a temperature in excess of the ash-fusion point.

The detrimental effect of these conditions can be successfully combated by the introduction of radiant-heating surface to the furnace, either by constructing the furnace entirely with water-cooled walls, or those sections subjected to the most intense temperatures, and ash deposition. Water-cooled furnace walls are usually connected with the boiler circulation so that the cooling medium is at saturated steam temperature; there is, therefore, a maximum absorption of heat by radiation, by which means the temperature of the wall is so reduced that it can be maintained in good condition without difficulty.

The reduction of wall-surface temperature by water cooling has many far-reaching effects, notably the permissible operation at high rates of heat input without undue maintenance. It can therefore be claimed that water-cooling allows reductions in the size of furnaces, provided that such reductions do not encroach on the dimensions required for adequate combustion space. Where ash is deposited on the wall at a temperature in excess of its fusing point, to which condition the major part of the wall maintenance may be attributed, the water wall in absorbing heat reduces the temperature of the ash to a value below its fusion point, thus returning the ash to a solid state, in which form erosion of the wall surface is avoided, and incidentally simplifying ash removal.

Reduction in Radiation Losses

A further benefit derived from the use of water-cooled walls takes the form of reduction in radiation losses, since most of the heat absorbed by the wall is conducted to the cooling tubes and not radiated to atmosphere as with an uncooled wall. There are occasions when, to prevent choking of the boiler surface, it is desirable to cool the gases, prior to their entry to the boiler, to a temperature below the fusion point of the ash. Where such conditions prevail the necessary reduction in gas temperature can be brought about by allowing a long flame travel and the installation of water walls, the heating surface of which will not be affected to any extent by the deposition of molten ash, neither will the operation of the unit be impaired since the gases do not have to pass through this surface.

It is usual to dimension the cooling surface to suit combustion conditions rather than from thermal consideration. Where combustion conditions permit the installation of cooling surface in the furnace there is less work to be done by the convection-heating surface of the boiler, which can be reduced, but the reduction so obtained is not equivalent to the percentage of the total heat absorbed by radiation. This is due to the reduction in gas temperature brought about by the furnace cooling surface, which lowers the mean temperature difference of the heat exchanging elements following the furnace; consequently, the rate of heat transfer in the convection section is not so great as would have been obtained had the furnace cooling surface been omitted.

This reduction in the rate of convection transfer is an important factor when the reconstruction of an existing unit for higher duty is under consideration. In many instances the introduction of radiant-heating surface to an existing unit in the form of water-cooled combustion chamber walls permits an increase in the evaporative capacity, but more often than not a greater part of the increase is due to improved combustion conditions rather than the added heating surface. As water-cooled walls will withstand much more severe conditions of operation than the plain refractory construction, their substitution for the latter frequently removes restrictions which had previously been imposed on the firing equipment in order to keep the maintenance within economic limits. These restrictions take the form of operation with a high percentage of excess air, together with low combustion rate for a mechanical stoker, or a low rate of heat release for a unit burning fuel in suspension. Where such conditions exist, the introduction of radiant-heating surface to the combustion chamber will permit appreciable and sometimes outstanding increases in evaporation because of its effect on the firing equipment, but where this equipment is already giving its maximum performance, then only small increases in the evaporative capacity can be expected for the reasons already defined, unless a higher final gas temperature is accepted.

Superheater Comparisons

While combustion conditions can generally be said to control the extent of radiant-heating surface, the position is reversed when superheater surface is installed in the furnace, the dimensions then being determined by the amount of heat it is desired to impart to the steam. Radiant-heat superheaters have for some considerable time been installed in combustion chambers for various methods of firing, but in spite of a reasonable degree of success their adoption has not been by any means universal. Placing the superheater in the furnace allows the maximum difference in temperature between the heat-exchanging bodies; thus, there is an appreciable economy in the heating surface required over that necessitated by the usual type of convection superheater where the temperature difference, particularly with a high final steam temperature, is, by comparison, very small.

A feature of the radiant-heat superheater is that it has a falling characteristic; that is, the final steam temperature is lowered as the load increases. This characteristic is explained by the fact that, although the total radiant absorption increases with the load, the increase is not so great as the increase in load, so that the amount of heat absorbed per unit quantity of steam is consequently reduced. With the convection type of superheater the characteristic is reversed; that is, the final steam temperature rises with the load unless means are adopted to vary the free area to gas flow or to regulate the gas quantity sweeping the superheater surface.

The explanation of this falling characteristic is due to a number of factors, among these being a lower gas-inlet temperature caused by the gases having previously imparted heat to radiant- and convection-heating surface, a lower mean-temperature difference and a reduction in the transmission rate due to the lower gas velocity. The form of these characteristics cannot be generally defined as they are dependent on many features which differ for each installation. The performance of the radiant-heat superheater will, for instance, depend on its position in the furnace and its relationship with other water-cooled surfaces, while the characteristic of the convection superheater is largely dependent on the nature of the heating surface through which the gases pass prior to their entry into the superheater chamber.

In general, however, it may be taken that the two types of superheater have opposing characteristics, and when installed in series have the effect of reducing the fluctuation in final steam temperature that is normally obtained over

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Tariffs

Readers of your correspondence columns have recently had an opportunity to consider the views expressed by Mr. Purse and Mr. Lee, which were carried a step further by an interesting suggestion advanced by Mr. H. L. Taylor in last week's issue. In my opinion, the wide divergence of views which generally exists on the subject of domestic tariffs, is due to two main reasons: (1) non-symmetrical construction of the bulk-supply and the retail tariffs, (2) hit-or-miss methods employed by the bulk-supplier and the distributor in passing on the charges to the customer.

Logically, any retail tariff—domestic or otherwise—should be framed along lines parallel to the buying tariff with a sufficient margin between cost and selling prices to admit of profitable working for the distributing authority. But as matters now stand, the supply authority purchases by the pound and sells by the yard which is an extremely risky business. The safe, and therefore sensible, domestic tariff would comprise a kW and kWh charge—which even then, in some cases, would vary according to the incidence of " Third Schedule " charges—in order that the business should not correspond to speculation.

It is generally admitted, however, that such a tariff in respect of domestic supplies would completely stifle further development and its introduction would probably destroy the business which has so far been secured. On the other hand, a two-part tariff to industrial consumers consisting of kW-kWh charges is regarded as ideal by the supply authority. That is because the costs are fully protected by the retail tariff. It should not be imagined that large industrial consumers take kindly to such a form of tariff and the reasons are precisely the same as those advanced in respect of the domestic load.

Reviewing the progress made in domestic directions during the past five years there can be no doubt that a domestic tariff having a fixed charge based on either rateable value or the area of the premises served, plus an attractive kWh charge, has yielded a tremendous increase in the volume of electricity sold to domestic consumers, which in the aggregate has represented profitable business for the supply authorities. If such a policy is sound and the procedure correct—and the results indicate that such is the case—then there is no place in our business for retail tariffs based on kW of m.d. because their effect is to stifle progress. Even in industrial directions, the tariff should be based on rateable value, or area, on grounds of equity. But what about equity for the supply authority also? It would seem that the fixed charge of the grid tariff should be based on the rateable value of the area served by the distributing authority because it is obvious that the selling tariffs must conform to the bulk tariffs.

At the same time, it can be realised that the eventual outcome will be along lines of graduated flat-rate charges in respect of all tariffs to all consumers, even in respect of " grid supplies," but until such a time it would seem that only the remoulding of the bulk supply tariff could justify any changes in the direction of a uniform domestic tariff such as are proposed from time to time. After all, there is nothing that is speculative about the grid tariff and it is not good for the distributing authorities concerned that, in the development of the service along national lines, the speculation attached to a good deal of the business transacted should be wholly on their side. Properly handled, the grid tariff should set the ideal form of retail tariff to the country and the basis should be equitable and applicable to all consumers.

JAMES RATCLIFFE,
Whitworth, *January 15th.* *Engineer and Manager.*

The Future of the Tramways

In his letter in your issue of January 15th Mr. S. G. Jackman seems to envisage tramcars careering down the centre of a congested highway at 20 m.p.h. The would-be passenger still has to risk life and limb in traversing the strip of roadway between kerb and vehicle, and vice-versa (holding up vehicles using that portion of the roadway), in an attempt to take a tram-ride.

Would he not rather see the passengers using a vehicle that draws alongside the kerb, discharging and picking up passengers in safety, and allowing other road-users to continue uninterrupted? Consideration of the passengers' safety is one (if not *the* one) reason why the L.P.T.B. is scrapping that anachronism, the tramcar.

One has to consider the conditions which exist on the busy highways of London and provincial cities, and adopt a remedy which is most easily and quickly adapted to suit those conditions. Roads for the use of tramcars are out of the question completely, and the roads in London which have car-tracks along them may be ranked, so far as the surface is concerned, as third-class highways. I have seen many a main road, especially in South London, with a definitely concave surface, due to the continual heavy service during the course of years having lowered the crown of the road.

I trust the L.P.T.B. will carry its trolley-bus conversion through to the letter, and then we shall stand a better chance of making and having safe roadways, a thing which is lamentably overdue.

London, N.W.9, *January 16th.* L. C. FORD.

[Mr. Jackman did not suggest that tramcars should travel at high speeds on highways, but in specially constructed subways in urban areas and on their own tracks on the surface in outlying districts.—EDS. ELEC. REV.]

Radiant-heating Surface in Boilers *(Concluded from preceding page)*

a range of boiler output when employing either type alone.

The advantage of the temperature characteristic of the radiant-heat superheater is greatly offset by the constructional problems it presents. In general terms, radiant-heat superheater constructions resemble closely those of water-cooled walls, but greater care has to be taken to ensure that the surface exposed to the gases is self-cleaning or, at least, arranged so that it can be maintained in a uniform condition by the use of externally controlled cleaning devices.

The need for a uniform condition of the heat-absorbing surface is due to the variation in transmission rate caused by ash deposits on the heater elements, which in practice may affect the final steam temperature to a considerable extent. For this reason radiant-heat superheater elements are usually arranged to protrude into the furnace well clear of the furnace wall, or else to present a perfectly flat surface to the gases which is not inducive to ash accumulation.

Elements, when arranged clear of the wall, usually take the form of 2-in. o.d. tubes, generally backed by a refractory wall at a distance of approximately 12 in. behind them. The alternative method of presenting a flat surface to the gases has been carried out by using forged boxes of rectangular or square section as the heater elements, by shrinking a square-sectioned covering over tubular elements and, more recently, by clamping flat-faced blocks to closely pitched superheater tubes. Of these constructions the protruding tube and the block-covered designs seem to be most favoured, especially the former, on account of the ease with which elements may be replaced and the relatively low initial cost.

Because the radiant-heat superheater is exposed to the furnace gases at their maximum temperature and superheated steam is used as the cooling medium, very severe conditions are imposed on the heating elements, which probably accounts for the limited number of this type that has as yet been installed. In order to keep the naturally very high temperature of the elements to the minimum, good contact between the steam and the heater elements must be maintained; this also, incidentally, makes the maximum use of the cooling system, thus minimising the extent of the surface required for a given degree of superheat. Good contact is obtained between the cooling medium and the elements by employing a high steam velocity to produce turbulent conditions within the elements, but, in addition, care must be exercised in the distribution of steam to the heater to prevent local overheating. Care should also be taken in supporting the elements to ensure freedom of expansion and to keep all stresses, other than those due to internal pressure and temperature, at the minimum.

Electrical Pocket Book

The 1937 edition of the "Practical Electricians' Pocket Book" has just been issued (Odhams Press, 2s. 10d., post free). It has been revised by Prof. C. L. Fortescue, and changes have been made in chapters on furnaces, power factor, a.c. motors, dynamos, rectifiers, regulations, transmission and distribution, illumination and domestic appliances. A further extension has been made in the voltage tables, which now include over 7,000 towns.

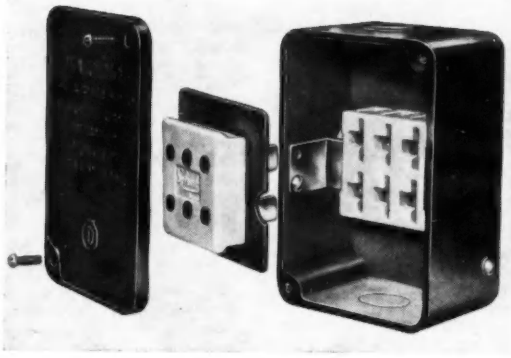
New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Small Isolating Link

An especially small isolating link suitable for isolating starters on machine tools so that they can be worked on with safety has recently been marketed by the DONOVAN ELECTRICAL CO., LTD., 46/7, Great Charles Street, Birmingham, 5.

The size is only 3⅞ in. by 4⅝ in., by 2 1/16 in., the maximum rating being 15 A at 660 V, a.c. or d.c. It is made only in triple pole form, and the fixed contacts are fully floating and self-aligning.



The "Solink" isolating link

Nursery Rhyme Shades

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, has introduced a range of novelty shades which are bell-shaped and moulded from coloured bakelite; they measure 2½ in. in diameter at the bell end and 2 in. high. The colours are red, white, green, blue, yellow and flame, and each shade carries a coloured pictorial representation of a popular nursery rhyme. The shades are packed twelve in a box, which is attractively adorned with nursery rhyme figures, and lends itself admirably to window or counter display settings.

Measuring Instruments

Instruments added to the selection marketed in this country by the Siemens & Halske department of SIEMENS-SCHUCKERT (GREAT BRITAIN), LTD., 30, New Bridge Street, London, E.C.4, include a traffic noise meter for measuring the peak values of impulsive sounds such as are produced by internal combustion engines, exhausts, &c.

A high-grade condenser microphone and three-stage amplifier feeding into a large indicating instrument directly calibrated in phons covers the range of 50-115 phons in three sweeps. A standard reference is provided for calibrating, and the instrument can be coupled to a recorder.

A universal objective instrument covering a wider range of complex noises consists of a multi-cell microphone feeding a three-stage amplifier connected to a directly indicating instrument. A special feature is the changeable characteristic; by means of ganged switching the instrument automatically follows the Kingsbury curve at five different noise levels. A rotary switch alters the sensitivity to nine different levels, and a standard is provided for calibration. An audio-frequency spectrometer comprises amplifying, heterodyning and band-pass filter circuits and enables noises of 36-18,000 cycles to be instantaneously analysed in the form of an amplitude and frequency characteristic on the screen of a cathode-ray tube.

The maximum time required for analysis is about 0.1 second. By connecting a microphone to the input side the noises produced by machines can be instantly split up into their constituent frequencies and, furthermore, complex frequencies on telephone and telegraph lines can also be analysed. The mixture is filtered and commutated by a rotary machine and provision is made for recording the curves by means of a cinematograph camera.

A "Ferrometer" for measuring the magnetic properties of small iron samples and the new types of iron alloys at normal mains frequency gives direct indications. Sample pieces of only 10 grammes weight can be used, and it determines flux density, magnetisation current (including the active and reactive components) and with a special co-ordinate recorder hysteresis loops can be directly drawn. The apparatus also enables remanence, coercive force, &c., to be measured, and in the preparation of hysteresis loops, not only the demagnetising effects but also the essential proportion of eddy currents are taken into account. The complete equipment is assembled in a large suitcase and is easily transportable.

A portable three-loop oscillograph with drum and continuous film cameras that can be inserted into the main equipment as and when required is of the permanent magnet totally enclosed type and available with natural frequencies up to 20,000 cycles. Loops of similar design with a very high sensitivity are also obtainable.

Silent Switches

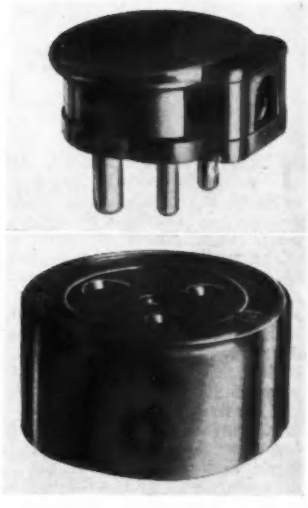
To meet the need for quieter tumbler switches A. P. LUNDBERG & SONS, LTD., 477/489, Liverpool Road, London, N.7, introduced the "London" underslung switch, but although the silencing arrangements of these switches achieve their object in making them less noisy than before, an entirely new construction has been found necessary to provide a switch which is completely silent in operation. This has been attained by the introduction of a mercury tumbler switch, in which a small mercury switch movement is incorporated as part of an ordinary tumbler switch with the usual "dolly" operation and vitreous porcelain base.

Supplies can be made up specially to requirements, in 5-A single-way and two-way types for flush fixing.

A Three-pin Plug and Socket

A three-pin plug and socket outlet manufactured in accordance with B.S.S. 546 has been introduced by the ORMOND ENGINEERING CO., LTD., Rosebery Avenue, London, E.C.1. Among the special features are an adjustable cord grip to take all types of flexible cable, finger shields to prevent accidental contact with live pins and slotted pins which are prevented from closing beyond the parallel position. Insulated barriers are provided to separate the conductors which are fixed to the contacts between washers by hexagonal terminal nuts with slotted heads; to facilitate correct wiring they are distinctly marked with the letters "E," "L" and "N."

A handgrip is provided to discourage gripping of the plug at the entry of the lead. The socket is fitted with solid brass slotted sockets, equipped with a spring ring, floating and self-adjusting to pitch. The actual base is of porcelain, the cover being moulded.



The Ormond plug and socket

Electric Oil Heater

An electric heater specially constructed for insertion in the oil tanks of aeroplanes is being made by ELTRON (LONDON), LTD., Salisbury Square House, London, E.C.4. The element is of the ring type but similar in design to the company's domestic immersion heater, although to obtain the necessary loading for the heating of oil tanks it is usually necessary to have two or three elements incorporated.

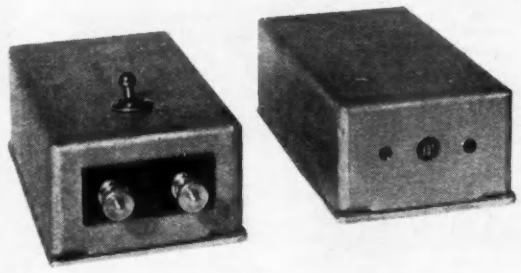
A temperature feeler rod with a small bi-metal circuit-breaker in the point is fitted close to one of the elements, and operates in conjunction with a contactor in the head of the instrument to cut off the supply at a predetermined temperature to avoid carbonisation or "cracking" of the oil. In the head of the instrument is a pilot lamp which is illuminated as soon as the electricity supply is switched on and the instrument is on circuit. The thermostat, switch and connectors are all totally enclosed, so that all the equipment is fireproof.

The "Eltron" electric heater being applied to an aeroplane oil-tank

E

Exploder Testing Units

The method of periodic testing of exploders recommended by the Safety-in-Mines Research Board is to utilise the small fuse heads which form the igniting medium in the standard detonators. On these lines two testing units have been developed by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, one a high-voltage tester and the other a cap-lamp exploder tester. Selection for testing is made by switching.



G.E.C. low-voltage and cap-lamp tester, and (right) a high-voltage tester

The units consist of a pressed-steel box in which is mounted the resistance and two screw terminals for attaching the exploder wires. At the end of the box opposite to the exploder terminals two spring contacts are fitted into which is placed the small fuse head.

In testing, the exploder is connected to the terminals of the appropriate tester, and the fuse head placed in the clip. The exploder is operated in the usual manner, and if the fuse head is fired the exploder can be regarded as being fit for service. There is no danger in the firing of the fuse head as the only effect produced is similar to that of striking a match without the corresponding flame. In the case of the low-voltage type, a change-over switch enables the tester to be used either for low-voltage or magneto exploders, or when changed over, the new type of cap-lamp exploder.

Vacuum Cleaner

A new external bag type vacuum cleaner, known as the "Junior" model, has been introduced by VACTRIC, LTD., North Circular Road, Cricklewood, London, N.W.2.

This machine has a pistol-grip handle with an insulated thumb switch incorporated. The bag is of the low-pressure type with an easy lock connection. A motor-driven brush gives a combined beating and suction cleaning action to the cleaner, and a simple height adjustment is provided for the nozzle. A special bottom plate prevents the carpet becoming marked, and a rubber buffer safeguards furniture from knocks. The accessories include a hose with a "Rub-a-Lock" coupling, extension tube, upholstery nozzle, crevice nozzle, soft brush and linoleum brush.

The "Vactric Junior"

Insulation Sleeving

"Synthulite" insulation sleeving is a new material introduced by J. FINER & Co., 12-13, Henrietta Street, Strand, London, W.C.2. Its mechanical properties are such that it can be bent and twisted without cracking, and always returns to its original state. In the 1-mm. diameter size it has a breakdown resistance of 6,000 V, and in the 3-mm. diameter size 8,000 V. This latter figure was corroborated by a leading firm of instrument makers.

"Synthulite" is non-inflammable, and its structure is unaffected by temperature variations between 170 and −70° F. It is resistant to all atmospheric influences, and can be stored without deteriorating. It is also oil-resistant. It is made in continuous rolls of 270 yd. in diameters from ½- to 6-mm. bore.

Modern Electric Furnaces

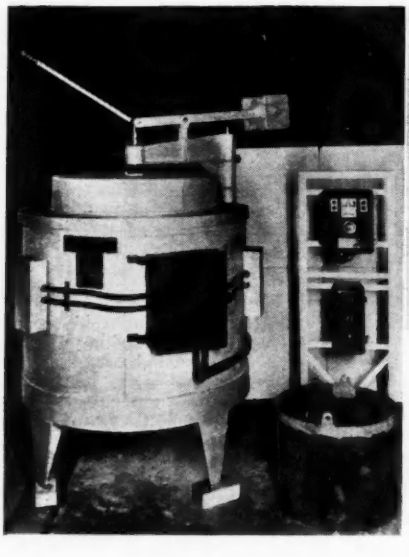
THE following notes and the accompanying illustrations relate to recently introduced standard and special products of the newly formed electric furnace manufacturing company, METALECTRIC FURNACES, LTD., Cornwall Road, Smethwick, Birmingham.

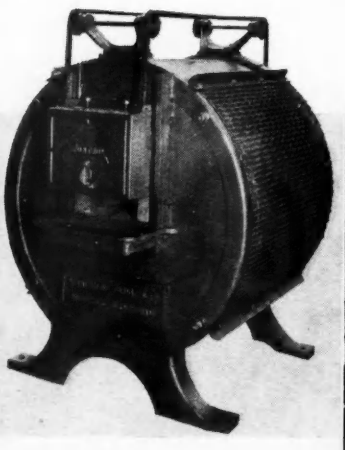
The vertical special-atmosphere equipment is designed for tempering purposes at temperatures up to 600 deg. C. The dimensions are 26 in. diameter and 32 in. deep. The 35-kW elements, together with the fan, are automatically controlled in such a way that they are switched off when the furnace door is opened. The charge is lowered into the furnace in the baskets. The tyre and wheel annealing furnace was supplied to an Indian railway. It measures 6 ft. by 6 ft. by 1 ft. 6in.

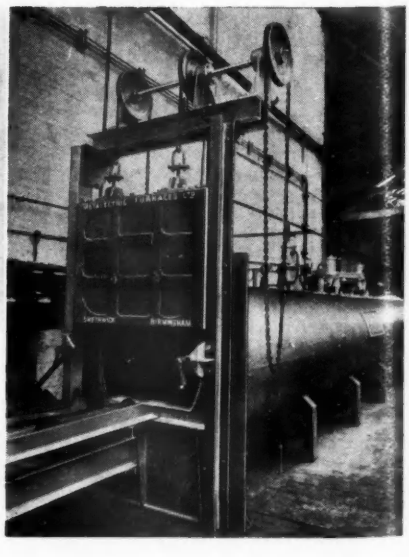
"Zontrol" portable furnaces are designed for general heat treatment up to 980 deg. C. Each unit has a rise and fall lever-operated heavily insulated door which completely prevents infiltration of cold air. A special movable sill facilitates loading and unloading the charge. An incorporated cubicle at the back houses the switchgear. A special "suspension" housing is provided for the nickel-chrome strip elements.

For the treatment of high-speed tool steels there is the "Circle" high-temperature furnace which is designed to provide up to 1,350 deg. C. A double-deck model has a pre-heating chamber suitable for temperatures of 800 to 900 deg. C. The chamber has a fabricated steel body and is lined with high-quality Scotch refractories and the hearth is of special high alumina material which enables the charge to be heated from below.

The low-temperature re-circulated atmosphere furnace is suitable for treating alloys at temperatures of about 400 deg. C. Even temperature is obtained by an appropriate disposition of the elements in relation to the special circulating fan. The model illustrated is 25 ft. long and 3 ft. 6 in. in diameter and it is loaded at 120 kW. It will anneal non-ferrous sections at the rate of 10 cwt. per hour with the aid of the "Duplex" charging machine. In a furnace for forging aluminium alloy bars the elements are contained in a separate chamber. The air is circulated at high speed through the elements to the bars. Even heating is assured and fine temperature control is afforded by a thermocouple in the air stream before the charge.







Three of the new Metalectric furnaces. From left to right: Vertical special-atmosphere equipment; "Circle" high-temperature unit; and a recirculated atmosphere low-temperature furnace.

British Overseas Electrical Trade

Ten per cent. increase in exports last year

THE year 1936 was the third in which our electrical exports showed recovery following trade depression, and although the rate of expansion (10 per cent.) was somewhat slower a definite upward trend was evident, culminating in an excellent total in December, when the value of electrical equipment shipped overseas (£1,486,639) was surpassed in only one like month during the past decade.

December's flourishing trade, which we hope augurs well for conditions in the current year, represented an increase of no less than 27 per cent. over that of the corresponding month of 1935, but an extra working day as compared with December, 1935, must be taken into account in assessing the relative value of the two months' exports.

Machinery exports were again good, as can be seen from the accompanying tables compiled from figures abstracted from the Board of Trade returns for the month. At £486,417 their value exceeded the total for the previous month (£457,153), which was itself the highest recorded for six years. More generating plant was sent to South Africa (+£26,591) and British India (+£25,817), while a good deal of other machinery was destined for some of our smaller foreign markets (+£90,302). Unspecified foreign countries also contributed an increase of £78,219 in the goods section—chiefly telegraph and telephone equipment—but generally speaking the main foreign markets continued to be very unreceptive. One exception was Portugal, shipments of goods to which expanded our fold, while Denmark's share was increased by £10,029.

Of the various types of goods exported the largest increase was in telegraph and telephone equipment other than radio (+£54,918), following meagre exports of this kind in November (−£35,943). Australia was largely concerned in the improvement, as is shown in the subsequent analysis. The values in parentheses are those for December, 1935:—

Australia, £42,795 (£28,690); Argentina, £12,124 (£17,089); South Africa, £11,935 (£17,479); Canada, £1,039 (£2,068); other foreign countries, £105,803 (£51,230); other British countries, £34,639 (£36,861).

EXPORTS AND IMPORTS DURING DECEMBER

	Exports. Dec., 1936.	Exports. Inc. or dec. compared with Dec., 1935.	Imports. Dec., 1936.	Imports. Inc. or dec. compared with Dec., 1935.
Submarine telegraph and telephone cables	£11,752	+ £10,220	*	—
Telegraph and telephone wires and cables (not submarine)	47,030	+ 11,126	*	—
Other insulated wires and cables	230,955	+ 25,696	£36,639	+ £9,772
Radio receivers, not radiograms (excluding valves)	35,468	+ 3,746	27,861	+ 7,517
Radio transmitters (excluding valves)	17,766	+ 11,694	*	—
Radio valves	37,842	− 2,291	20,779	+ 2,690
Other radio parts and accessories	45,980	+ 14,253	64,823	+ 9,311
Telegraph and telephone apparatus (other than radio)	208,335	+ 54,918	*	—
Electric carbons	*	—	13,758	+ 2,060
Incandescent lamps	44,506	− 6,877	18,759	+ 7,594
Other lighting apparatus	41,697	+ 6,532	52,661	+ 17,460
Primary batteries	14,977	− 3,336	1,196	+ 659
Accumulators	70,738	+ 30,738	*	—
House service meters	18,108	− 3,174	*	—
Other electrical instruments	27,503	+ 7,236	24,478	− 2,952
Unenumerated electrical goods and apparatus	147,565	+ 25,238	72,256	+ 10,662
Electric generators up to 200 kW	33,975	− 12,240	*	—
Electric generators over 200 kW	90,764	+ 66,881	*	—
Electric motors	132,101	+ 52,998	32,920†	+ 19,041
Convertors and transformers	56,259	+ 18,363	*	—
Starting and controlling gear for motors	51,541	+ 3,412	*	—
Switchgear	111,110	+ 2,327	*	—
Other electrical machinery	10,667	− 3,955	12,037	+ 1,563
Electric vacuum cleaners	*	—	14,623	− 306
Total	£1,486,639	+£313,505	£392,790	+£85,071

* Not classified separately. † Not railway and tramway motors.

EXPORTS AND IMPORTS DURING 1936

	Exports. 1936.	Exports. Inc. or dec. compared with 1935.	Imports. 1936.	Imports. Inc. or dec. compared with 1935.
Submarine telegraph and telephone cables	£75,453	− £72,611	*	—
Telegraph and telephone wires and cables (not submarine)	514,018	+ 105,689	*	—
Other insulated wires and cables	2,362,455	+ 234,197	£394,266	+£160,066
Radio receivers, not radiograms (excluding valves)	294,763	+ 21,327	237,049	− 16,720
Radio transmitters (excluding valves)	233,112	+ 14,690	*	—
Radio valves	408,395	− 86,908	237,586	+ 42,702
Other radio parts and accessories	437,195	− 95,199	842,912	+ 107,628
Telegraph and telephone apparatus (other than radio)	1,764,839	+ 43,065	*	—
Electric carbons	*	—	140,302	+ 24,788
Incandescent lamps	596,476	+ 25,462	172,614	+ 42,517
Other lighting apparatus	502,988	+ 36,406	522,851	+ 135,111
Primary batteries	182,942	+ 6,238	7,936	+ 2,266
Accumulators	565,722	+ 62,240	*	—
House service meters	198,530	+ 32,589	*	—
Other electrical instruments	224,108	+ 13,681	279,753	+ 1,299
Unenumerated electrical goods and apparatus	1,669,557	+ 148,532	841,646	+ 87,773
Electric generators up to 200 kW	338,644	+ 35,186	*	—
Electric generators over 200 kW	608,461	+ 124,909	*	—
Electric motors	1,216,324	+ 194,805	338,018†	+ 97,640
Convertors and transformers	829,932	+ 241,043	*	—
Starting and controlling gear for motors	581,208	+ 141,758	*	—
Switchgear	1,183,913	+ 92,826	*	—
Other electrical machinery	134,567	− 9,753	170,457	+ 59,362
Electric vacuum cleaners	*	—	188,965	− 58,826
Total	£14,923,602	+£1,310,172	£4,374,355	+£685,570

* Not classified separately. † Not railway and tramway motors.

Exports of wires and cables were also well up. Although the bulk went to Empire countries, an improvement in shipments to foreign countries is noticeable:—

Rubber insulated wires and cables.—Australia, £28,753 (£22,429); South Africa, £25,433 (£16,437); British India, £16,940 (£28,235); New Zealand, £12,243 (£4,651); other British countries, £13,968 (£12,323); foreign countries, £12,393 (£9,716).

Electric wires and cables (insulation other than rubber).—Australia, £33,400 (£23,129); South Africa, £31,328 (£32,052); British India, £19,896 (£33,151); other British countries, £21,307 (£11,950); foreign countries, £15,294 (£11,186).

The substantial shipments of accumulators (75 per cent. increase) possibly reflect greater use of battery operated

BRITISH ELECTRICAL EXPORTS DURING DECEMBER

Destination.	Goods and apparatus, Dec., 1936.	Inc. or dec. compared with Dec., 1935.	Electric generators, Dec., 1936.	Inc. or dec. compared with Dec., 1935.	Electric Motors, Dec., 1936.	Inc. or dec. compared with Dec., 1935.	Other electrical machinery, Dec., 1936.	Inc. or dec. compared with Dec., 1935.
Irish Free State	£55,810	+ £6,656	*	—	*	—	*	—
Channel Islands	21,317	+ 9,022	*	—	*	—	*	—
Union of South Africa	131,554	+ 9,937	£44,073	+ £26,591	£23,942	+ £8,064	£60,316	− £11,415
British India	100,977	− 32,429	37,186	+ 25,817	16,581	+ 5,645	34,106	− 11,075
British Malaya	24,834	+ 9,855	*	—	*	—	9,264	+ 3,132
Ceylon	6,226	+ 3,063	*	—	*	—	*	—
Hong Kong	6,389	− 3,644	*	—	*	—	*	—
Australia	160,758	+ 51,127	15,663	+ 8,909	20,694	+ 12,747	23,595	+ 7,987
New Zealand	68,366	+ 19,120	*	—	5,458	+ 2,528	11,672	− 1,050
Canada	7,650	+ 1,282	10,166	+ 8,468	2,651	− 248	3,789	+ 2,181
Other British Countries	77,413	+ 34,056	9,916	− 12,980	16,328	+ 6,688	26,344	+ 12,023
Sweden	11,114	− 590	*	—	*	—	*	—
Denmark	22,770	+ 10,029	*	—	*	—	*	—
Netherlands	13,846	− 4,928	69	− 480	*	—	5,961	+ 5,303
Belgium	11,708	+ 3,195	*	—	*	—	*	—
France	19,154	− 41	*	—	*	—	1,567	− 563
Portugal	20,970	+ 15,576	*	—	*	—	*	—
Spain	1,852	− 5,474	*	—	*	—	*	—
Italy	366	− 8,074	*	—	*	—	*	—
Greece	4,260	− 59	*	—	*	—	*	—
Rumania	3,424	− 240	*	—	*	—	*	—
Egypt	6,137	− 9,002	*	—	*	—	1,061	− 2,276
China	7,903	− 13,265	*	—	*	—	2,405	− 1,643
Brazil	10,941	+ 6,746	*	—	*	—	*	—
Argentina	46,300	+ 5,582	*	—	2,886	+ 944	4,723	+ 3,900
Soviet Union	*	—	—	− 108	—	− 29	*	—
Other Foreign Countries	158,183	+ 78,219	7,666	− 1,576	43,561	+ 16,659	44,774	+ 13,643
Total	£1,000,222	+ £185,719	£124,739	+ £54,641	£132,101	+ £52,998	£229,577	+ £20,147

* Not classified separately.

vehicles overseas. One of the few apparent decreases was in electric lamps, but here reduced prices or a preponderance of smaller lamps must have accounted for the falling off in value, because the number sent abroad was 142,203 against 133,255.

Imports as a whole amounted in value to £392,790, an increase of £85,071 (27 per cent.) over December, 1935. The total was, however, somewhat less than in October and November last.

Smaller shipments to foreign countries prevented the year's trade making a better showing, ten foreign countries between them taking £500,000 less in the goods and apparatus section. The balance was restored by Empire and South American markets. In the case of Argentina, our telegraph and telephone equipment was chiefly responsible for the rise of £136,530. This is borne out by the following analysis:—

BRITISH ELECTRICAL EXPORTS DURING 1936

Destination.	Goods and apparatus, 1936.	Inc. or dec. compared with 1935.	Electric generators, 1936.	Inc. or dec. compared with 1935.	Electric motors, 1936.	Inc. or dec. compared with 1935.	Other electrical machinery, 1936.	Inc. or dec. compared with 1935.
Irish Free State	£465,566	− £4,310	*	—	*	—	*	—
Channel Islands	155,010	+ 10,576	*	—	*	—	*	—
Union of South Africa	1,772,485	+ 168,056	£171,274	− £69,212	£303,142	+ £4,058	£974,698	+ £178,632
British India	1,201,388	+ 12,901	221,192	+ 93,734	171,596	+ 10,622	492,847	+ 97,202
British Malaya	258,579	+ 78,684	*	—	*	—	98,110	+ 33,114
Ceylon	97,952	+ 23,213	*	—	*	—	*	—
Hong Kong	150,861	+ 43,284	*	—	*	—	*	—
Australia	1,422,980	+ 100,087	146,031	+ 87,414	140,466	+ 23,736	199,160	+ 69,881
New Zealand	663,572	+ 160,118	*	—	45,690	+ 10,542	143,916	+ 37,935
Canada	104,201	+ 35	67,755	+ 38,375	51,961	+ 14,182	26,652	+ 6,799
Other British Countries	582,793	+ 24,862	189,029	+ 55,855	147,734	+ 16,894	256,907	− 13,496
Sweden	142,429	− 39,070	*	—	*	—	*	—
Denmark	170,931	+ 18,289	*	—	*	—	*	—
Netherlands	147,408	− 76,949	3,485	− 22,653	*	—	21,330	+ 9,740
Belgium	120,089	− 26,829	*	—	*	—	*	—
France	195,089	− 6,836	*	—	*	—	33,175	− 1,223
Portugal	87,462	+ 69	*	—	*	—	*	—
Spain	52,132	− 70,092	*	—	*	—	*	—
Italy	26,793	− 107,965	*	—	*	—	*	—
Greece	35,270	− 11,139	*	—	*	—	*	—
Rumania	69,548	− 10,067	*	—	*	—	*	—
Egypt	94,667	− 58,943	*	—	*	—	14,824	− 3,786
China	143,174	− 19,221	*	—	*	—	32,337	− 14,452
Brazil	240,427	+ 129,592	*	—	*	—	*	—
Argentina	540,159	+ 136,530	*	—	20,370	− 3,986	21,439	− 5,134
Soviet Union	*	—	6,822	+ 2,232	633	− 3,224	*	—
Other Foreign Countries	1,089,588	+ 14,523	141,517	− 25,650	334,732	+ 121,981	414,225	+ 70,642
Total	£10,030,553	+ £489,398	£947,105	+ £160,095	£1,216,324	+ £194,805	£2,729,620	+ £465,874

* Not classified separately.

Telegraph and telephone apparatus (not radio).—South Africa, £321,940 (£325,074); Australia, £302,636 (£304,805); Argentina, £267,991 (£171,547); Canada, £12,147 (£15,440); other foreign countries, £518,924 (£644,743); other British countries, £341,201 (£260,165).

Wires and cables of British manufacture were in good demand during the year, even in foreign countries. An analysis of exports of this type is as follows:—

Rubber insulated wires and cables.—Australia, £338,994

The chief sources from which electrical equipment was obtained, with comparative figures in parentheses, were as follows:—

Goods and apparatus.—United States, £93,717 (£76,942); Germany, £77,076 (£67,041); Netherlands, £62,897 (£50,669); Belgium, £23,656 (£12,102); Switzerland, £18,588 (£16,942); Austria, £7,194 (£3,371); France, £6,896 (£6,277); other foreign countries, £27,971 (£21,961); British countries, £15,215 (£13,132).

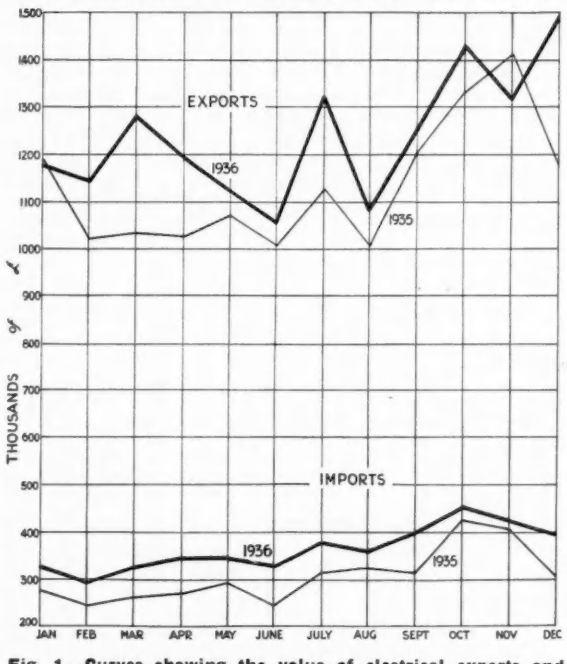


Fig. 1.—Curves showing the value of electrical exports and imports in each month of 1935 and 1936

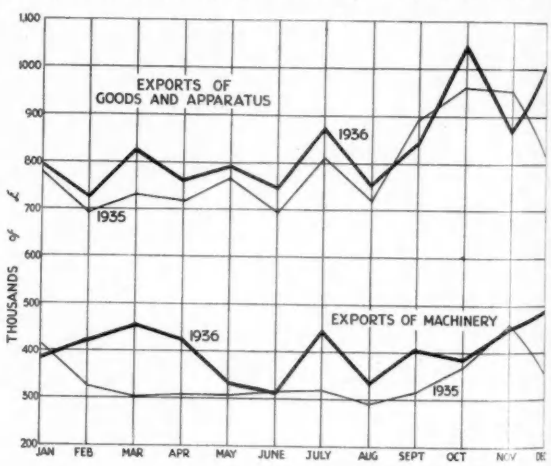


Fig. 2.—Exports of goods and apparatus and machinery

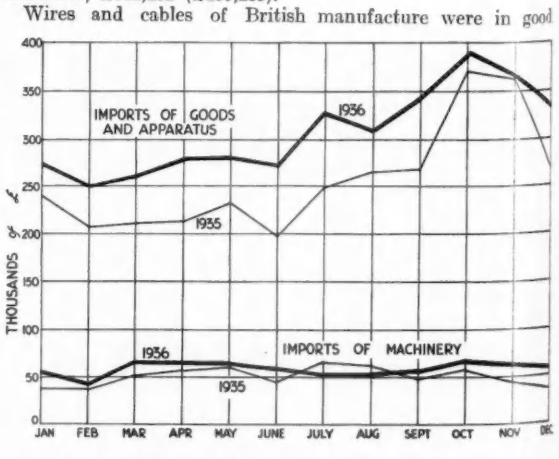


Fig. 3.—Imports of goods and machinery shown separately

Electric vacuum cleaners.—United States, £9,747 (£4,909); Germany, £1,479 (£830); Sweden, £1,057 (£2,996); Canada, £232 (£3,947); other foreign countries, £2,099 (£2,247).

With the £1,310,172 recovered last year Britain has in three years regained roughly five and a half million pounds' worth of its electrical export trade. Rising prices partly accounted for last year's larger total. This is deducible from a comparison of the weight and value of machinery exports, giving an average price per ton of £158 last year against £149 in 1935. Further, radio receivers exported numbered 55,649 against 56,056, while the value was £294,763 (£273,436).

Henley's Centenary

THE centenary of the manufacture of insulated cable by W. T. Henley was celebrated on the grand scale last Friday when W. T. Henley's Telegraph Works Co., Ltd., entertained a company of about 1,200 members of the staff and distinguished guests at Grosvenor House, Park Lane, W. All branches of the electrical industry and of the community at large were represented, and the chair was occupied by Sir Montague Hughman, chairman of the company.

Following an excellent menu and the loyal toast, the chairman introduced the principal guest, Sir John Simon, Home Secretary, who proposed the toast of the company. In the course of his speech Sir John spoke of the long line of electrical pioneers whose ideas were being practically applied to-day by such companies as Henley's. He recalled seeing as a boy the *Great Eastern* by which the first Atlantic cable was laid when the electric telegraph was a practically new thing. He was happy to be given the opportunity of proposing this toast, for the great enterprise of Henley's stood for all that was best in our British commercial traditions: fair and honest dealing, good understanding between all taking part in a common work, pride in the past, confidence in the future and a determination that a great name should be handed on in the days to come.

Sir Montague Hughman, responding to the toast, reviewed the early achievements of W. T. Henley, and paid a tribute to his energy and determination, and spoke of the work which the company had carried out during its long history. He claimed that they had laid cables in the deepest part of the ocean, and had also laid the highest cable yet installed—in the Andes. He paid a tribute to the late Sir George Sutton who was instrumental in the establishment of the Cable Makers' Association, which had provided the best possible cables at reasonable prices and to-day made about 90 per cent. of the cables produced in this country. The company owed a deep debt to its stalwarts of the past—Messrs. Hatton, Hall, Salmon, Potter, Nichols, Boeree, Davison and many others, and to those who had retired but were still living, among them being Messrs. Savage, Thorn, Rosling, Wright, Hedgcock and "Young Jimmy Hall." They finished their first hundred years with all records broken, but they would go on unceasingly maintaining the organisation in the highest possible state of efficiency and magnitude. He felt sure that they had among them men to whom the future of the company could be left with confidence.

The health of the guests was toasted by Mr. W. F. Bishop (director and general manager), who apologised for his inability to mention every one of the distinguished visitors by name. He made particular reference, however, to the presence of Sir Kingsley Wood, Minister of Health, several members of Parliament, the President of the Federation of British Industries (Lord Hirst) and representatives of industry, including electricity, banking, insurance and transport and of practically all the associations working in various spheres for the advancement of the electrical and rubber industries. Sir Kingsley Wood was one of the members for Woolwich and, in addition, was a former Postmaster-General. Mr. H. T. Young, the President of the I.E.E., had done much to develop his particular branch of the industry and bring it up to date, and in spite of his business activities had devoted much of his time to furthering the general interests of the electrical industry and profession.

At the Henley Centenary Dinner: From left to right: Lord Iliffe, Sir John Simon, Sir Montague Hughman and Sir Kingsley Wood

Sir Kingsley Wood, replying, referred to his intimate knowledge of the company, and spoke of the excellent relationships existing between the management and the staff; the team spirit was most pronounced and was a great factor in the company's success. He made particular reference to the company's pension fund—a most valuable institution.

Mr. H. T. Young, who also responded for the guests, spoke of himself as a "satisfied consumer" for twenty-five years. After a reference to the reliable work of the company, he said that the electrical industry in general held Henley's in very high esteem. He took the opportunity of paying a tribute to the work of Mr. Llewelyn Atkinson, who until recently was director of the C.M.A., and to Dr. P. Dunsheath, the company's chief engineer, for his contributions to the science of cable-making and his address as chairman of the Transmission Section of the I.E.E.

Sir Maurice Simpson, C.S.I. (director) proposed the toast of the British Press, which, he said, was unsurpassed for veracity, balance and independence. They were fortunate in having with them Lord Iliffe, who was pre-eminently qualified to speak for the Press as he owned or controlled nearly 200 newspapers and was an active but unostentatious supporter of many benevolent causes. Sir Maurice also spoke of the helpful and important part played by the electrical Press.

The Rt. Hon. Lord Iliffe, C.B.E., thanked Sir Maurice on behalf of the lay Press, and said that it was due to the development of long-distance telegraphic and telephonic communications that the modern newspaper became possible, and in this Henley's had played a large part. Conversely, Henley's had every reason to be grateful to the Press, which had spent large sums upon cabled messages and therefore had contributed to the revenue of the cable companies and consequently to Henley's prosperity. Lord Iliffe, referring to the romance of W. T. Henley's life, maintained that the days of great adventure and achievement in the fields of commerce by men with determination and little else had not gone by.

Mr. R. W. Hughman responded for the electrical Press.

British Electrical Overseas Trade (*Continued from previous page*)

(£281,082); South Africa, £298,117 (£241,035); British India, £173,954 (£210,707); New Zealand, £93,896 (£67,781); other British countries, £156,012 (£146,690); foreign countries, £119,267 (£107,846).

Electric wires and cables (insulation other than rubber).—South Africa, £328,546 (£345,329); Australia, £249,148 £167,490); British India, £217,897 (£233,491); other British countries, £212,277 (£153,870); foreign countries, £174,347 (£172,937).

Imports of wires and cables were also exceptionally heavy, increasing by nearly 70 per cent. While exports of radio valves, parts and accessories fell in value by £182,107, imports rose by £150,330. Another big increase in imported goods is seen in lighting apparatus (+£177,628). The total value of electrical equipment brought into this country during the year was £4,374,355, an increase of £685,570 (18 per cent). A quarter of this came from the U.S.A., Germany being the next largest supplier. The shares of the principal countries, with comparative figures, were as follows:—

Goods and apparatus.—United States, £1,033,494 (£860,037); Germany, £832,027 (£753,166); Netherlands, £662,255 (£587,421); Switzerland, £219,112 (£179,348); Belgium, £215,643 (£110,939); France, £119,680 (£113,064); Austria, £72,360 (£87,497); other foreign countries, £336,791 (£251,921); British countries, £185,553 (£146,092).

Electric vacuum cleaners.—United States, £86,904 (£60,562); Canada, £32,009 (£110,218); Sweden, £20,762 (£37,613); Germany, £17,069 (£13,371); other countries, £32,221 (£26,027).

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

The "Electrical Review" Index

The index to Vol. CXIX of the ELECTRICAL REVIEW (July-December, 1936) is now available. Any reader who requires a copy may obtain one gratis from the Publisher, ELECTRICAL REVIEW, Dorset House, Stamford Street, S.E.1. Cloth binding cases may also be obtained at the price of 3s. 6d. each (3s. 10d. post free).

Electrical Ironmongers

Mr. E. B. Holloway, hon. secretary of the Electrical Section of the Ironmongers' Federated Association, recently gave an address to a gathering of ironmongers in London. In the course of this, as reported by the *Ironmonger*, Mr. Holloway urged his audience to take the electrical business seriously, remembering that they were pioneers in the electrical field. He said that it was not essential for them to run installation departments to sell electrical appliances. He went on to say:—"It may not be generally known in our trade that special terms are accorded to members of other electrical associations which are not available to our members. My Committee feel that such a position is not to be tolerated, and they will seek a line of defence. A strong Electrical Section is essential if we are to be effective, and each member must do his part by keeping his electrical goods to the forefront of his business and by demonstrating that he is a bona-fide electrical trader. It is not my intention to make an excursion into electrical trade politics to-night. In fact, I expect most of you are as weary of them as I am. But I am rapidly coming to the conclusion that if our members would rally to their Association we should have so much power in our hands that we should be in a position to call the tune instead of having it called for us as at present. The latest suggestion is that we drop our own Association and join up with another association, which would be formed in connection with the E.C.A. My Committee is still considering this suggestion, so I cannot say much about it—except perhaps to comment that up to the present the E.C.A. have not looked very favourably upon our aspirations, and I cannot visualise a great change taking place even if our members do join this suggested new Association. For those of us who are doing so much work voluntarily it would no doubt be the easiest way out. By taking this course of action we should, however, betray those who support and trust us, and that will not do."

A Factor's Centenary

Besides giving customers a special discount of five per cent. off all non-proprietary goods, H. Snuggs & Co., Ltd., are commemorating the centenary of the formation of the company by converting a storeroom opposite their main premises at 331, Old Street, London, E.C.1, into a special showroom for the display of domestic electrical appliances, lighting equipment for the Coronation, cables, switches and other accessories, as well as hardware products. Although the company has been engaged as electrical factors for only five or six years, already approximately one-third of the business is in electrical goods and apparatus.

New Works at Croydon

The Croydon Engineering Co., Ltd., informs us that owing to the increasing demand for its motors and equipment it has recently removed to larger premises. A new factory situated in Commerce Way, off Purley Way, Croydon, has been erected and is now in full production. The factory is on a corner site and is arranged on one floor covering an area of approximately 13,000 sq. ft., with ample land available for extension.

I.F.S. Electrical Imports

November last proved a rather quiet month as regarded the imports of electrical machinery and cognate material into the Irish Free State a total of £109,523 having been attained as compared with £128,446 in November, 1935. The appended table gives the details of the imports during the eleven months ended November last as compared with the corresponding period of the previous year, an increase of £48,449 being shown. It will be seen that seven of the scheduled items underwent an increase and five a decrease, the greatest fall being in radio equipment.

	Jan.-Nov. 1935.	Jan.-Nov. 1936.
	£	£
Electric motors	43,106	49,722
Other electrical machinery	187,206	193,726
Dry batteries and parts	29,910	19,019
Electric lamp bulbs	65,475	47,125
Electric lighting accessories, fittings and parts	72,218	72,073
Electric wires and cables, insulated	82,039	94,596
Telep. and teleg. apparatus	27,692	41,735
Radio receivers, complete	112,581	98,305
Radio-gramophones, complete	5,631	2,919
Other radio apparatus, fully or partly assembled	5,953	8,726
Radio parts and accessories	81,363	103,002
Other electrical goods and apparatus	247,575	288,250
	£960,749	£1,019,198

An Exporters' Guide

The twenty-first edition of the "International Mercantile Diary and Year Book," which has just been received (Syren & Shipping, Ltd., price 10s. 6d. net), is a complete guide to the exportation of goods all over the world. The rearrangement made in the last two years is now complete, and the present issue does not differ materially from its predecessor. The international section deals with every country in the world in turn, giving the exporter information about sending goods or postal matter. Reference to the various countries is facilitated by an index and gazetteer. There is also a section containing a collection of useful information.

Contractors' Dinners

The annual dinner, whist drive and dance of the Electrical Contractors' Association of Scotland was held at Edinburgh on January 15th, when Mr. G. Mackintosh, chairman of the Edinburgh Branch, presided. Among those present were Councillor Airlie, Convener of the Edinburgh Corporation Electricity Committee, Messrs. H. M. Fulton, Glasgow, president of the Association; A. Albrecht, director of the Electrical Wholesalers' Federation; C. W. Sully, director of the Electric Lamp Manufacturers' Association; F. C. Vine, of the Accumulator Manufacturers' Association; J. Aikman, chairman of the Scottish Section of the Electrical Wholesalers' Federation; D. Pinkerton, chairman of the Edinburgh Building Trades Federation; E. Seddon, Edinburgh city electrical engineer; H. C. Babb, chairman of the Scottish Section of the Institution of Electrical Engineers; and W. Finlay, secretary of the Association. Mr. W. T. Dean, chairman of the Electric Light Fittings Association, was to have been present at the dinner, but was indisposed. Proposing the toast of "The Guests," the chairman referred to the very

The new works of the Croydon Engineering Co., Ltd.

cordial relations existing between the Edinburgh Corporation and the electrical contractors. The Association was glad to support a policy which aimed at a high standard of work, he said. The toast was replied to by Councillor Airlie, Mr. Fulton, and Mr. Albrecht. Councillor Airlie said that the Corporation Electricity Supply Department and the electrical contractors were not competitors; their work was complementary, and each played its part very well indeed. Mr. Airlie said that recently they had been faced in the Corporation Supply Department with an increase in the cost of coal of no less than 37 per cent., and as they burned something like 260,000 tons a year, it would be realised they were faced with a problem in trying to maintain the existing level of prices.

The annual dinner of the Bristol Branch of the Electrical Contractors' Association held recently at the Royal Hotel, Bristol, Alderman J. H. Inskip (chairman of the Bristol Electricity Committee) said that this year they were again able to report record figures relating to the consumption of electricity in Bristol and to the number of consumers, especially those on the domestic all-in tariff.

A Refrigeration Conference

A conference of Yorkshire and Lincolnshire supply engineers assembled at Leeds on January 13th, to hear Mr. J. N. Waite, of Hull, and Mr. J. I. Bernard, E.D.A., on the subject of refrigeration. Mr. Waite gave an exhaustive survey of his experience in Hull, especially emphasising the enormous field awaiting development amongst the modern type of artisan dwellings. Mr. Bernard described the development of refrigeration in this country and said that the next E.D.A. campaign would begin in March, and would be developed on a much larger scale than in 1936. He urged members to prepare their schemes at once in order to be ready. The addresses were followed by a discussion. Mr. N. McLean, the Area Committee Chairman, presided.

The auditorium of the Broadway Cinema, Meir, Staffs

Registered Electrical Contractors

At the last meeting of the Executive Committee of the National Register of Electrical Installation Contractors, the application for registration of H. C. Troldahl, Ltd., Newcastle-upon-Tyne, was accepted. At the same meeting five applications were declined.

Orders Recently Booked

Among recent contracts, International Combustion, Ltd., has received two large boiler orders. These comprise four "Lopulco" pulverised fuel fired boilers to be installed at the Karabuk Iron and Steel Works, Turkey, and three stoker fired boilers for Ford Paper Mills, Ltd.

J. Browett Lindley (1931), Ltd., have sent us a list of contracts they have recently received for compressors, engines and condensing plant. These include two 1,000 cu. ft. per min. two-stage motor-driven air compressors for the Austin Motor Co.'s new aircraft factory, and an 1,100 cu. ft. per min. two-stage motor-driven air compressor for Joseph Webb & Sons, Ltd., Bury. The orders for engines and condensing plant include a number from abroad.

Employment in December

Employment in the engineering industry during December showed little general change and continued good on the whole and was very good in electrical engineering. The *Ministry of Labour Gazette* states that the total out of work in the engineering industry was 63,359, or 6 per cent., a decrease of 0.1 per cent., as compared with November, and comparing with 9.7 per cent. in December, 1935. In the electrical engineering section the number of unemployed was 3,308, the percentage falling from 3.4 to 3.3 (5.2 per cent. in December, 1935). The unemployed in the electrical wiring and contracting industry numbered 3,490 or 9.1 per cent., as against 9.2 per cent. in November and 11.6 per cent. in December, 1935. In the electric cable, apparatus, lamps, &c., group the unemployed decreased from 7,809 to 7,676, the percentage remaining at 5.1 (8.4 per cent. in December, 1935).

Another Centenary

Larmuth and Bulmer, Ltd., are celebrating their centenary this year. Founded in 1837, the company to-day manufactures all classes of machinery for the making of hemp ropes, wire ropes, electrical flexibles, &c., up to the largest power cables. It is anticipated that the output this year of electric cable machinery and of wire and hemp rope machinery will be the greatest in the history of the company. Twelve years ago Thomas Larmuth & Co., Ltd., of Salford, and John Bulmer & Sons, of Newcastle-upon-Tyne, amalgamated, and they have concentrated at the Salford works, bringing the specialities of both concerns under one roof.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that the January 1st cost-of-living figure (51 per cent. above the 1914 level) will not involve any alteration in wages on the third day in February.

A Cinema Installation

The new Broadway Cinema, Meir, Staffs, which was recently opened, has a number of novel electrical features. The proscenium surround and the splay wall panels are excellent examples of the art of modern colour lighting, while the stage and auditorium colours are synchronised in colour harmony. The Holophane "Auto-Selective" system using a single dial selector-controller simplifies operation. The stage draperies and tracks were supplied by Holophane, Ltd., and the curtains are of silk velour with plain areas of deep blue, sea green and silver. The screen curtains are of the festoon type, made in silver satin and made to reef vertically instead of opening and closing on a horizontal track. The moulded contour scheme of the auditorium is by Mollo & Egan, who designed it in conjunction with Holophane, Ltd. The electrical contractors were J. Bagguley & Sons, and the architect was Mr. A. G. Sherwin.

Electro-plating

The "Canning Practical Handbook on Electroplating, Polishing, Bronzing, Lacquering and Enamelling," which first appeared in 1899, has now reached a thirteenth edition. The scope of its 359 pages is sufficiently indicated by the title, but recent research developments have made it necessary to revise the last edition published only three years ago in order to deal adequately with the rapidly widening field of application—to metallic finishes, automatic plating and polishing, filtration of solutions, anodic oxidation of aluminium, and motor-driven plating barrels. Special attention has been given to nickel-plating and the section on chromic-plating has been considerably amplified. There is a good contents table dealing with the various sections at the beginning of the book and an adequate cross-reference index at the end. Numerous tables, diagrams and photographic illustrations enhance the value of this practical guide to and reference source for modern electro-plating, which is obtainable from W. Canning & Co., Ltd., 133-137, Great Hampton Street, Birmingham.

Social Events

The annual dinner of the Enfield Cable Works, Ltd., was held on Saturday last at Harrods Restaurant, S.W., the Earl of Verulam (chairman of the company) presiding. In proposing the toast of "The Enfield Cable Works, Ltd.," Mr. P. F. Deakin said he was glad to be able to report that Mr. F. Plutte (managing director) was well on the way to recovery. They were grateful to the sales department both at home and overseas and the contracts section for keeping the works busily employed. A happy spirit existed between the staff and the works, and he hoped that this would continue. The Earl of Verulam, who responded, said they met at the end of a year in which records had been set up in the quantity of cable turned out, orders received, and the number of people employed. During the year new machines had been installed, and they had decided to erect a new building which he hoped would be complete by September next. New plant would be installed to meet the needs of the rubber section. They would then have modern plant in every department of the factory, and with the skilled labour available would be able to obtain the best results. Mr. F. Plutte (junior) read a message from his father wishing the staff a successful evening. The toast of the guests was proposed by Mr. W. Hewitt, and Mr. H. J. Walton responded. Following dinner there was dancing, interspersed with a cabaret.

The annual smoking concert of the English Electric (Stafford Works) Engineering Society which took place on January 6th was attended by over 200 members. The chair was taken by Mr. J. Bissett, general manager of works, who was supported by a number of officials of the company. Mr. A. D. Sloan, chief engineer, proposed "The Company," which was responded to by Mr. J. Rogers, general manager of the Stafford

Works. The "Engineering Society" was proposed by Mr. H. S. Carnegie, Mr. F. Wallis replying. An excellent entertainment, including songs and instrumental music, &c., had been arranged by Mr. B. Townsend.

The Guiseley Lamp Works of Crompton Parkinson, Ltd., held their annual party at the King's Hall, Bradford, on January 8th. An enjoyable evening was shared by about 600 employés and friends. A whist drive proved a big attraction for those who were not disposed to spend the whole evening in the ballroom. In addition to the prizes for the winners at the whist drive, there were several dance prizes. The party was attended by Mr. and Mrs. Albert Parkinson, and a message of good wishes was received from Mr. Frank Parkinson.

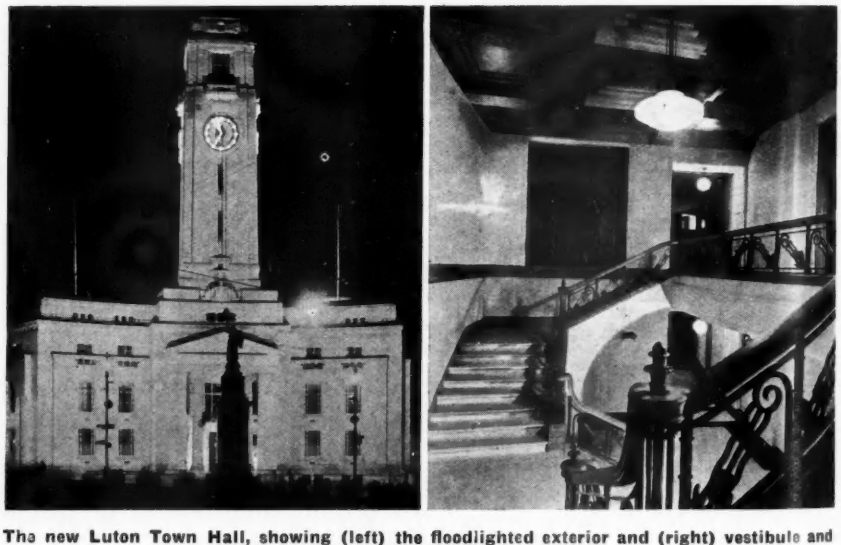
The "Northmet" Sports Association is holding its staff ball on February 2nd at the Portman Rooms, Baker Street, W. Tickets (3s. each) can be obtained from Mr. P. A. Thorogood, Electricity House, Kingsbury Road, Kingsbury, N.W.9.

Lancashire Dynamo & Crypto's party for the children of the employés of the Trafford Park Works, which is held annually under the auspices of the Social Club, was once again the occasion of 200 children spending a happy Saturday afternoon and evening on January 16th. After tea there was a Punch and Judy show followed by a circus which was performed by several members of the company. The remainder of the evening was spent in various amusements and the party terminated with the distribution of presents, sweets, fruit, &c., by Santa Claus (Mr. H. P. Pentelow).

A children's Christmas party organised by the Sports Club of M.C.L. and Repetition, Ltd., was held in a local schoolroom in Birmingham on December 30th. About 110 boys and girls related to the employés sat down to tea, following which there were games and an entertainment. Mr. J. E. Naismith, director and general manager, in the guise of Santa Claus, distributed presents from a Christmas tree to the children.

Luton Town Hall

The new Luton Town Hall, which was recently opened by the Duke of Kent, is a modern building designed by Bradshaw, Gass & Hope, and erected by E. D. Winn & Co., Ltd. The electrical installation, which is of a standard in keeping with the character of the building, has been carried out by T. Clarke & Co., Ltd. Outwardly, this white stone building is of striking proportions. It is floodlighted from the basement to the top of the tower (the latter being visible for miles around) by a system carried out by the General Electric Co., Ltd. For the complete scheme only twelve floodlights are employed. On each side of the side entrances are installed octagonal ornamental bracket fittings equipped with 100-W lamps. Immediately inside the portico is a finely designed octagonal lantern fixture. The entrance hall and main staircase to the first floor are illuminated by a pendant fitting of three-tier construction with surmounting trumpet and etched and plain glassware, the metal-work being of bronze finish. There are, in addition, matching corner brackets. The ground floor corridors are illuminated by polished opal glass spherical fittings with bronze metal-work. This method of lighting is employed throughout the upper and lower floor corridors. G.E.C. totally enclosed polished opal glass fittings with bronze metal-work are used throughout the building for general office lighting purposes. In the rooms of both the Mayor and Town Clerk indirect lighting is provided by dished ceiling fixtures of obscure plate glass with clear edges. G.E.C. electric fires are also installed in the rooms of the higher officials of the Council.



The new Luton Town Hall, showing (left) the floodlighted exterior and (right) vestibule and staircase illuminated by G.E.C. fittings

The lighting of the Council Chamber has special features, the dome being arranged for daylight and artificial lighting. Above, it is arranged as a laylight with nine G.E.C. reflectors, which is augmented by six G.E.C. circular stem floor standards, the metal-work of which is finished in Grecian bronze. On the floor below the Council Chamber there is a small hall which is lighted by G.E.C. units in the form of pendants in chromium metal-work and polished opal glass with clear edges. Around the walls pleasing bracket lighting fittings of a distinct semi-indirect character supply a softly diffused illumination. In the committee rooms specially designed G.E.C. pendants are also employed, as well as a system of panel illumination.

Licensing of Electricians in South Africa

The Convention of the Association of Municipal Electricity Undertakings (South Africa) was recently requested by the Secretary of the Interior to state whether in its view (a) it was practicable to frame regulations to provide for the licensing of electricians and (b) if such legislation were introduced whether it should be administered by the local authorities or by the central Government under the machinery sections of the Factories Act. The Association decided to reply in the affirmative to the first question.

Japanese Electric Lamp Exports

During the first nine months of last year Japanese exports of electric lamps totalled 7,090,000 yen in value, an increase of 35 per cent. compared with the corresponding period of 1935. The largest increase took place in shipments of miniature lamps for purposes of decoration, which constituted half the total. The leading markets were the Far East, India, United States and Great Britain.

Lamp Manufacture in the I.F.S.

A request that Ismay & Co. should be facilitated in the opening of a factory in the town for the manufacture of electric lamps and other products was recently sent to the Irish Free State Minister for Industry and Commerce by the Midleton Council. The Minister's reply stated that a general outline of a very wide programme of manufacture, in which this company and others were stated to be interested, was placed before him by a deputation from Midleton recently, when he had promised to give the fullest possible consideration to any detailed proposal that might be submitted to him. It was, however, suggested at the same time that, having regard to the arrangements already made for the production of electric lamps in the country, these goods should be omitted from any proposal that might be prepared for his consideration. The Minister assured the Council that any plans submitted to him for the opening of a factory at Midleton which could be reconciled with the scope of the market and the interests of existing industries would receive his most sympathetic consideration.

Solus, Teoranta, of Bray, the company at present holding a monopoly of the Irish Free State market for electric lamps and similar products, has written to the Midleton Council protesting against its action in endeavouring to set up a similar industry there.

Klaxon Flashers

In our last issue, when referring to flashers made by Klaxon, Ltd., we used the expressions 4 A per *watt* and 15 A per *watt*. The italicised word should, of course, have been "way."

Trade Announcements

Barimar, Ltd., has recently opened a new department for handling electrical repairs, and can now undertake all kinds of repairs to electric motors, magnetos, dynamos, switchgear, &c. The company's main business is that of scientific welding engineers, and it repairs casings, &c.

In the "New Companies" section of our issue of January 8th we stated that the governing director of F. H. Pride, Ltd., was Mr. H. C. Price. This was incorrect and should have read Mr. Herbert C. Pride.

Goodliffe Electric Supplies, Ltd., 8, Eagle Street, High Holborn, W.C.2, have been appointed sole agents for the "Mark Time" time-lag switch.

Suspension of Copper Restriction

On January 13th the Selection Trust issued a statement to the effect that, as from January 14th, all restriction on the production of copper would be removed temporarily. All members of the restriction scheme have agreed on conditions under which curtailment will again become effective, if necessary.

Prices of Materials

Messrs. Henry Gardner & Co. report, January 20th: Copper bars (best selected), sheet and rod, £87, £6 inc. English pig lead, £29 5s., 15s. dec. Spelter, £21 18s. 9d., £1 inc. English block tin, £232, £1 inc.

Messrs. Edward Till & Co. report, January 20th: No change in the price of India rubber, Para fine.

Diary

We have received a neat pocket diary, bound in dark brown leather, from Alklum Storage Batteries, Ltd.

New Catalogues and Lists

The Butterley Co., Ltd., Derby.—An illustrated art catalogue showing ironwork made by the company and including constructional work, foundry work, mill and colliery equipment.

Callender's Cable & Construction Co., Ltd., Thames Embankment, London, E.C.4.—A catalogue of cables for rural transmission.

Gent & Co., Ltd., Faraday Works, Leicester.—A catalogue of "Pul-syn-etic" electric impulse clocks and "time discipline" apparatus.

W. H. Sugden & Co., Ltd., Glenny Road, Barking.—A price list of reconditioned motors.

British Thermostat Co., Ltd., Teddington Works, Windmill Road, Sunbury-on-Thames.—Catalogue No. 301A dealing with hydraulically operated motorised valves.

C. H. Champion & Co., Ltd., National House, Wardour Street, London, W.1.—Technical details in the form of a pocket-book about "Ship Suprexa" carbons.

British Thomson-Houston Co., Ltd., Rugby.—Details of a hand-lamp transformer are given in a new leaflet.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—Details of a new universal cartridge fuse.

A. J. Balcombe, Ltd., 52/58, Tabernacle Street, London, E.C.2.—A list of defrosting clocks for refrigerators.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—An 88-page illustrated art catalogue of wiring supplies, insulators, tools, &c.

Henderson's Wholesale Electrical & Radio, Ltd., Electric House, Queen's Road, Brighton, 1.—A catalogue of "Keyway" switchgear and "Keylite" wood fittings.

Bankruptcy Proceedings

J. L. Gaved, 7, St. Stephens Street, Bristol, electrical transmission engineer.—The public examination herein was continued at the Guildhall, Bristol, recently. It was reported that the unsecured liabilities amounted to £3,645, while the assets were estimated to realise £3,255. The deficiency was put down at £390. In November, 1929, debtor entered into partnership with another to trade as electrical engineers at Lichfield. That partnership was dissolved in 1932, debtor continuing to trade at Tamworth, with a branch office in Bristol. Since the receiving order had been made debtor had been in employment. He admitted that his failure was mainly attributable to undercutting on contracts. Included in his assets was a patent which he valued at £3,000, but he had not succeeded in disposing of it. He was asked to supply an account, and, subject to his complying with that order, the examination was closed.

A. King, 6, Beresford Square, Woolwich, S.E.18, wireless and electrical dealer.—The receiving order herein was made on a creditor's petition recently. According to the statement of affairs filed by debtor there are gross liabilities of £3,535, of which £3,320 is expected to rank for dividend, and there is a similar deficiency. It appears that in 1929, without capital, debtor commenced business as a wireless dealer under the name of the Beresford Wireless Co. at 6, Beresford Square, Woolwich. Debtor has also carried on branch businesses at East India Dock Road, Poplar, 9, Powis Street, Woolwich, Reading, Chatham, and Villiers Street, Strand. As a result of selling below authorised prices he was unable to obtain supplies from wholesalers. Early in 1935 he sold the businesses at Poplar, Chatham, and Beresford Square, Woolwich, to a limited company. Debtor purchased for cash 999 £1 shares in the company, which he transferred to another as his nominee, and he (debtor) was appointed general manager of the company. The company did not take over the lease of the premises at Poplar nor his debts totalling £1,855, of which he discharged £633 by instalments out of his salary. He guaranteed payment of debts contracted by the company to the extent of £1,835. In May, 1936, a compulsory winding-up order was made against the limited company, and in July, 1936, debtor sold the lease of the premises at Poplar. After August, 1936, he acted as secretary to another limited company dealing in wireless goods, but in the interim judgment was obtained against him for £1,040 under one of his guarantees, and the bankruptcy proceedings ensued. He attributed his failure to liabilities under guarantees, and to the compulsory liquidation of the limited company.

L. G. Baker and **C. S. White,** trading under the style of L. Baker & Co., 21, Brentgovel Street, Bury St. Edmund's, and at Mildenhall, Ely, Elmswell, and as L. Baker White & Co., at Stowmarket, radio and electrical dealers.—The public examination herein was continued at the Guildhall, Bury St. Edmund's, recently. It was stated that the joint estate showed liabilities of £1,891, with assets of £1,851. The separate estate of L. G. Baker showed unsecured liabilities of £108 with assets of £15, and a deficiency of £93, while that of C. S. White disclosed unsecured liabilities of £122, assets of £13, and a deficiency of £109. Debtors attributed their failure to heavy expenses incurred in endeavouring to establish a new business, and expenses and repairs in connection with cars. The Registrar ordered a cash and goods account to be furnished, and the examination was adjourned.

H. A. Simpson and **E. Dyson,** trading in co-partnership as Simpsons, 18, Eastbank Street, Southport, radio and electrical engineers.—The public examination was held at the Court House, Liverpool, on January 12th. It was reported that the joint unsecured liabilities were £3,529, and the estimated assets £875. H. A. Simpson said that the business was short of capital and he had borrowed a sum of £3,010 over a period of five months. In November last the loan creditor obtained judgment for £2,841 and costs. Some of the money was used in the business and the remainder in the purchase of cars and other expenses. He was ordered to file a cash and goods account dealing with the business and showing the disposal of the money received from the loan creditor. It was stated that Eva Dyson, who was H. A. Simpson's mother, had taken no active part in the business. The examination was adjourned.

K. Nicholson, 8, Southgate, Bradford, and **F. Hyde,** 29, Swinton Place, Bradford, lately carrying on business in co-partnership as The City Electrical Co., 8, Southgate, Bradford, and 100 and 102, Morley Street, Bradford, electrical contractors.—The first meeting of creditors of the above was held on January 12th at the Official Receiver's office, Hallfield Chambers, 71, Manningham Lane, Bradford. The statement of affairs disclosed ranking liabilities of £427, with assets estimated at £31, leaving a deficiency of £396. The debtor K. Nicholson attributed his failure to adverse judgment in a county court action involving heavy costs, insufficient capital, and the bankruptcy of a firm from whom a substantial amount was due under a contract. The debtor F. Hyde attributed the failure to losses in an estate agency business carried on between 1920 and 1922, owing to lack of capital, and heavy depreciation of real property, interest on loans and mortgages, and losses in connection with the electrical business. The case, being a summary one, was left in the hands of the Official Receiver as trustee.

A. E. Hudgell, radio dealer, &c., lately carrying on business at 4, Rosemont Parade, East Finchley.—An application was made on January 14th to Mr. Registrar Kean at the London Bankruptcy Court for an order of discharge on behalf of this debtor, who failed last June, with liabilities £804 and no assets. Mr. S. W. Hood, Official Receiver, reported that the debtor originally began business in 1921 in partnership at Hastings under the style of Webber & Hudgell. That business, with a branch at Rye, was sold in July, 1931, the debtor receiving £800 for his half share thereof. In October, 1931, he started a similar business as "Gells" at Finchley. It mainly consisted of contracts for the wiring of premises for electricity and of dealing as retailers in wireless sets and electrical accessories. The trading was unsuccessful: a number of executions were levied and the landlord distrained on the stock in April, 1936, whereupon the business was closed. The discharge was suspended for two years.

J. Freedman (known as J. Freeman), and formerly carrying on business as Euston Radio and also as Albion Electric Co., Albion Works, Lampeter Street, N.—This debtor again attended on January 13th before Mr. Registrar Kean at the London Bankruptcy Court for public examination upon accounts showing total liabilities £2,346 (ranking £2,250) and net assets £73. In examination the debtor has stated that she began business in October, 1935, and attributes her insolvency to loss incurred by the purchase and trading of the "Euston Radio" business; to losses by theft, to the effect of seasonal depression on trade and to insufficient capital. Mr. Newman, Assistant Official Receiver, questioned the debtor upon cash and goods accounts which had been lodged and the examination was concluded.

H. H. Moore, junior, electrical engineer, "The Lindens," West Cliff Gardens, Bournemouth.—Receiving order made January 11th on debtor's own petition.

W. Hodge, electrical engineer, 3, Saltash Street, Plymouth.—Last day for receiving proofs for dividend January 29th. Trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.2.

C. E. Hallam (Midland Radio Service), wireless and electrical dealer, 342, Meadlow Lane, 191, and 275A, Arkwright Street, Nottingham.—First and final dividend of 3s. 4¾d. in the £, payable January 19th at 22, Regent Street, Park Row, Nottingham.

F. E. Walton, electrical engineer, Eel Pie Island, Twickenham, Middlesex.—First meeting January 22nd at 29, Russell Square, W.C. Public examination February 12th at the Court House, Half Acre, Brentford.

C. W. Watson, electrical and wireless engineer, 33, Rainhall Road, Barnoldswick, Yorks.—Application for discharge to be heard on February 9th at the County Court, Manor Row, Bradford.

A. Schnittlinger, radio dealer (described in the receiving order as A. Davis), 64, Coborn Road, Bow, London.—Discharge suspended for eighteen months until June 16th, 1938.

H. C. Bridgman, electrical engineer, 37, Canynge Road, Clifton, Bristol.—Discharge suspended for twelve months until December 17th, 1937.

P. K. Eichenberger, wireless dealer, 30, Market Place, Boston.—Trustee, Mr. E. C. Midgley, 1, St. Swithin's Square, Lincoln, Official Receiver, released December 31st.

H. Carnell, radio engineer, The East Hill Battery Charging Station, 94, East Hill, St. Austell, Cornwall.—Trustee, Mr. G. C. Hancock, 12, Princes Street, Truro, Official Receiver, released December 31st.

G. F. Richards, wireless and electrical dealer, 1, Peel Street, Kidderminster.—Last day for receiving proofs for dividend January 27th. Trustee, Mr. K. V. Hooper, 1, Priory Street, Dudley, Official Receiver.

A. E. Cowee, radio and electrical engineer, 113, Mount Pleasant Road, Tottenham, N.17.—Receiving order made January 14th, on debtor's own petition.

Company Liquidations

All-in Radio, Ltd.—Winding up voluntarily. Liquidator, Mr. G. D. Haynes, 7, Great Castle Street, W.1.

Cawley's Wireless Service, Ltd.—Meetings February 25th at 41, Castle Street, Liverpool, to receive an account of the winding-up by the liquidator, Mr. P. W. Ardran.

Pacific & European Telegraph Co., Ltd.—Meeting February 18th at Electra House, Victoria Embankment, W.C.2, to receive an account of the winding-up by the liquidator, Mr. A. R. Smith.

Coatbridge & Airdrie Electric Supply Co., Ltd.—Meeting February 17th at 46-7, New Broad Street, E.C.2, to receive an account of the winding-up by the liquidator, Mr. D. Robertson.

Dissolution of Partnership

Moxon Bros., electricians, 71, Duke Street, Barrow-in-Furness.—Messrs. W. L. and A. N. Moxon have dissolved partnership.

Electricity Supply

Lighting, Domestic, Power

Bedford.—SUB-STATION.—The Electricity Committee is to erect a sub-station at East End, Cranfield.

Birkenhead.—MAINS AND SERVICES.—Sanction to a loan of £30,000 for mains and services is being sought by the Electricity Committee.

SUB-STATION.—A sub-station is to be erected in Dacre Street at a cost of £3,540.

Blackburn.—HIRE PLANS.—A special meeting of the Electricity Committee is being held to consider further a report of the electrical engineer on the adoption of a hire scheme for heavy-duty domestic appliances.

Blackpool.—JOINT METER READING WITH GAS COMMITTEE.—A report has been submitted by the borough treasurer on the possibility of a system of joint reading of gas and electricity meters being adopted, and a scheme is to be formulated.

Bournemouth.—LOWER CHARGES.—The Bournemouth and Poole Electricity Supply Co., Ltd., has reduced its charges after negotiations between a joint committee of the Bournemouth, Christchurch and Poole Corporations and the company, as follows:—Business and domestic two-part tariff "unit" charges from ¾d. to ½d.; power from 2d./1¼d. to 1¾d./1d. per kWh; and meter rentals up to 1,500-W capacity from 2s. to 1s. 3d., per quarter. There is also a concession in regard to inside installations of specially lighted shop windows under the business two-part tariff, and a special rate of 2d. per kWh is offered for outside lighting, advertising signs, &c., on separate circuit.

Bradford.—NEW CABLES AND SWITCHGEAR.—Plans of the city electrical engineer for laying 33 kV cables from the Valley Road power station to Odsal sub-station; replacing the 6.6 kV cables from Bowling Dyeworks to Manchester Road by cables having a larger sectional area; and providing additional high-voltage switchgear at Odsal sub-station, have been approved by the Electricity Committee. The estimated cost is £47,079.

Brierfield.—LOAN.—The Urban District Council has received sanction to borrow £5,000 for the purchase of appliances to be sold on hire-purchase terms and for the assisted wiring scheme.

Burton-on-Trent.—LOANS.—Sanction has been obtained by the Electricity Committee to borrow £44,000 for mains and services and £9,000 for plant.

Canterbury.—EXTENSION.—Application is to be made by the City Council for permission to borrow £2,402 for the purpose of extending the supply to the Wilderness, Nackington Road.

Cardiff.—SUPPLY TO FLATS.—Mains and switchgear are to be provided by the Electricity Committee at a cost of £1,885, to supply the Castle Court flats, Westgate Street.

GAS *v.* ELECTRICITY FOR STREET LIGHTING.—The city engineer is to make inquiries in comparable towns regarding the cost of their street lighting by electricity and by gas.

MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £2,518.

Chesterfield.—NEW PLANT.—New converting plant is to be installed by the Electricity Committee at the power station. For extensions at Walton the Electricity Committee has obtained sanction to borrow £12,607.

Consett (Co. Durham).—SUPPLY TO COUNCIL HOUSES.—A scheme, estimated to cost £4,521, for the supply of electricity to all Council houses, has been approved by the Urban District Council.

Dover.—NEW CABLE.—A decision has been reached by the Electricity Committee to lay a high-voltage cable, at a cost of £850, at St. Margaret's, for an additional supply to the Bay Hotel and three new houses.

East Ham.—EXTENSIONS.—The Electricity Committee is to extend mains and provide a sub-station in Katherine Road at a cost of £2,160.

Ellon (Aberdeenshire).—STREET LIGHTING.—The Town Council has accepted a tender of £495 for the installation of a new street lighting system. The Grampian Electricity Supply Co. has agreed to pay half the amount.

Gravesend.—EXTENSIONS.—The Electricity Committee is to extend mains to Eastcourt Farm and Church Lane at a cost of £2,100.

Great Yarmouth.—MAINS AND SERVICES.—Sanction is being sought by the Electricity Committee to borrow £20,000 for mains and services and £15,000 for domestic appliances.

Inverness.—OPPOSITION TO CALEDONIAN SCHEME.—The Town Council has resolved to oppose the Caledonian Power Order in principle.

Leyton.—SUPPLY TO FACTORIES.—A sub-station is to be erected and high- and low-voltage cables laid by the Electricity Department in order to provide a supply to new factories being built on the Seymour Road estate of Lea Bridge Factory Estate, Ltd.

SUB-STATION.—It is proposed to provide an outdoor sub-station and equipment at a cost of £2,160 so as to enable a supply of electricity to be given to the filtration plant at the Whipps Cross bathing pond and an additional supply to be made available in the rapidly developing Snaresbrook area.

Lichfield.—INDUSTRIAL LOAD.—As the load of the Trent Valley Maltings is likely to increase, the high-voltage mains are to be extended to the Maltings and transforming equipment provided, subject to a minimum revenue of £240 per annum being guaranteed. Further, an additional supply is to be provided to Alrewas Mills, where new plant has been installed.

LOANS.—Sanction is being sought by the Electricity Committee to loans of £7,000 for mains and services, £1,500 for sub-station equipment, £3,000 for meters, £3,000 for apparatus to be let out on hire, and £1,500 for assisted wiring.

London.—SOUTH LAMBETH LIGHTING SCHEME.—The Lambeth Borough Council has decided to have the entire 34½ miles of streets in its southern area illuminated by means of electric-discharge lamps. The contract has been placed with the South London Electric Supply Corporation, Ltd. The lamps to be installed are to be 400 and 250 W "Osira," totalling in all 1,032, while the General Electric Co., Ltd., will also supply the "Di-Fractor" lanterns, chokes, condensers and relays. The South London Electric Supply Corporation, Ltd., already supplies about 450 lamps in the northern portion of Lambeth, practically all of the electric-discharge type.

HAMMERSMITH.—The borough engineer has been instructed to prepare a scheme of modern lighting for Westway.

ST. PANCRAS.—Permission has been received by the Electricity Committee to borrow £6,055 for meters, £8,463 for consumers' electrical apparatus, £56,523 for mains and services, and £8,837 for consumers' wiring.

It was recently reported that the thermal storage installation in the new town hall had been put into operation to dry out the building, and that the Central Electricity Board had granted special terms by which a saving of about £430 per annum would be made in the cost of heating the town hall.

The ten-year agreement under which the Electricity Department undertook to provide lighting in Regent's Park in place of the original gas lighting expires next March. Negotiations have been proceeding with a view to a renewal of the agreement or the provision of a new scheme of lighting by electric-discharge lamps. The Crown Estate Paving Commission has stated that it is not at present in a position to consider such a new scheme, and it is proposed to renew the existing lighting contract for a year.

Melton Mowbray.—OVERHEAD LINES.—The General Purposes Committee of the Rural District Council recommends that no objection shall be offered to the Mid-Lincolnshire Electric Supply Co., Ltd., erecting overhead lines from Hose Villa to Clawson Hall, and from Abb Kettleby to Holwell.

Middlesbrough.—CABLES.—The Town Council is to lay additional cables from the Fallows Street and Dundas Mews sub-stations at a cost of £3,400.

Northern Ireland.—GENERATION OF ELECTRICITY.—The Ministry of Commerce has issued a return showing that 62,006,000 kWh of electricity was generated by authorised undertakings in Northern Ireland during the quarter ended December 31st, 1936, as compared with 54,992,000 kWh in the corresponding quarter of 1935, an increase of 7,014,000 kWh (12.9 per cent.). The total quantity of electricity generated during 1936 was 204,368,000 kWh compared with 171,298,000 kWh in 1935, an increase of 33,070,000 kWh (19.3 per cent.).

Oxford.—DOMESTIC ELECTRICITY CONSUMPTION.—It is stated that 2,067,108 kWh was used by Oxford colleges in 1936. In 1931 the quantity was 435,237 kWh. Last year the average use of electricity per head in the colleges was nearly 1,000 kWh.

Plymouth.—LOANS.—The Electricity Committee has obtained sanction to borrow £2,775 for sub-stations, £6,848 for mains, £17,348 for sub-station equipment, and £1,270 for fire protection apparatus.

ELECTRIC LIGHTING.—The existing electric lighting in Devonport is to be improved at an initial cost of £1,535.

PLANT FOR COAL HANDLING.—To improve facilities for unloading coal at the Prince Rock generating station a coal-handling conveyor and telpher plant are being purchased by the Electricity Department.

Portsmouth.—EXTENSIONS.—The Electricity Committee is to extend mains at South Hayling, Locksheath, Waterlooville and Portchester at a cost of £3,002.

Purley.—SUB-STATION IMPROVEMENTS.—The County of London Electric Supply Co., Ltd., is contemplating extensive additions to the existing sub-station and offices in High Street.

Rotherham.—MAINS AND CABLES.—The Electricity Committee is to supplement the feeder network throughout the area, involving approximately 22,000 yd. of cable, at a cost, including additions to main and auxiliary switchgear and apparatus, of £28,000.

Scarborough.—LOAN.—Application is being made by the Town Council for sanction to borrow £1,408 for overhead lines and also for switchgear modifications.

SUB-STATION.—The Electricity Committee is considering the erection of a sub-station at Sandside.

South Africa.—EXTENSION OF POWER STATION.—Johannesburg City Council proposes to spend more than £250,000 on further extensions to its power station and on the distribution system. The new plant which will be required at the power station includes a 20,000-kW turbo-generator, two boilers to cost £109,066, as well as transformers and a cooling tower.

South Shields.—NEW EQUIPMENT.—The Town Council is to install new equipment at the Dean Road sub-station in readiness for the new trolley-bus service.

LOANS.—Sanction has been received by the Town Council

to borrow £10,000 for mains and £5,000 for consumers' apparatus in connection with hire-purchase schemes.

Stretford.—STREET LIGHTING.—The Corporation is to prepare a comprehensive scheme for street lighting in the borough.

Sunderland.—NEW EQUIPMENT.—The Town Council has approved a recommendation by the Electricity Committee for extensions to the high-voltage feeder and sub-stations, including additional switchgear, at a cost of £23,638.

Swansea.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains to the Maes-y-gelynen housing estate at a cost of £1,148.

ELECTRICITY FOR SCHOOLS.—It has been decided to install electricity at the St. Helen's and the Morriston senior girls' and infants' schools.

Sweden.—ELECTRIC POWER STATIONS.—Among the public works on which expenditure is proposed in the new Swedish Budget are several relating to Government-owned hydro-electric power stations. For the big Stadsforsen station on the Indalsaelven River another Kr. 3,500,000 is allotted. It is intended to build this station bigger than originally planned, and the total cost will be Kr. 19,100,000 instead of Kr. 15,000,000. A second set is to be installed at the Sillre power station, while Nykvarn power station on the Motala River will be enlarged. Several other works are planned, including the laying of a main distribution line between Porjus in the North and Västeraas in central Sweden, thus connecting the north and the central power systems.—*Reuter's Trade Service.*

Torquay.—TESTING EQUIPMENT.—The Electricity Committee is to modernise the testing equipment at Newton Abbot at a cost of £1,300.

Timperley (Cheshire).—SUPPLY ALTERATION.—The Altrincham Electric Supply, Ltd., has applied for consent to change the frequency and voltage of the supply.

Walsall.—REPLACING OLD MAINS.—Authority has been given to the Electric Supply Committee to replace a number of old distributor mains at an estimated cost of £3,603.

Weymouth.—EXTENSION.—The Electricity Committee is to afford a supply of electricity to a new housing estate at Radipole Lane.

Whitby.—OVERHEAD LINE.—The North-Eastern Electric Supply Co., Ltd., is to erect an overhead line from Staithes to Dale House. The scheme has been approved by the Rural District Council.

Whitley Bay.—ILLUMINATIONS.—A vote is to be taken among the electors on the question of promoting a Bill in Parliament seeking certain powers, including permission to spend public funds on illuminations.

Wimbledon.—GIFT TO CONSUMERS.—A rebate of 20 per cent. on the December quarter accounts has been granted to consumers by the Electricity Committee.

Wolverhampton.—NEW EQUIPMENT.—The Electricity Committee is to provide larger feeders and modified current transformers at a cost of £5,926.

LOAN.—Sanction to a loan of £75,000 is being sought by the Electricity Committee for mains, transformers and switchgear.

SUPPLY TO WORKS.—The Electricity Committee is to afford supply to the works of the Fischer Bearing Co., at a cost of £11,137.

Traction

Africa.—UNDERGROUND RAILWAY CONTEMPLATED.—It is reported in the Rand Press that the construction of an underground tube railway in Johannesburg is being given serious thought.

Belgium.—RAILWAY ELECTRIFICATION.—A Belgian Commission has issued a report in very favourable terms concerning the efficiency of the Brussels-Antwerp line as converted to electric traction. Recent statistics show an increase of 22.3 per cent. in the traffic between Brussels and Malines, 10 per cent. between Malines and Antwerp, 13.7 per cent. between Antwerp and Malines, and 19.7 per cent. between Malines and Brussels.

Birkenhead.—REPLACEMENT OF TRAMS.—Buses are to take the place of trams on the Circle route, the last remaining tram route in the borough.

Hampshire.—ELECTRIFICATION DISCUSSED.—Speaking at a recent meeting at Winchester, Mr. S. W. Smart, of the Southern Railway, said that immediate electrification of the line to Southampton had not been seriously considered. Whether it would be done in the next ten years was hard to say. Personally, he doubted it, but that did not mean that it was impossible. Asked about the danger of electric lines through agricultural country, Mr. Smart said that they had electrified through Sussex and so far there had been no case of mishap either to human beings or animals arising from the electrification. Where there were occupation crossings over the line the contact rail was gapped for an adequate distance.

L.N.E. Railway.—SIGNALLING SCHEMES.—The L.N.E.R. has completed plans for the modernisation of the signalling equipment at Newcastle-on-Tyne and at the east end of Waverley Station, Edinburgh. At Newcastle the existing signals in the vicinity of the Central Station are of the semaphore type, and, together with the points, are operated by electro-pneumatic power from four signal boxes. One box is to be replaced by a new one equipped with a control panel on which will be a chart of the lines, with thumb switches controlling the points and signals; the points will continue to be operated by electro-pneumatic power, but the semaphore signals will be replaced by the electric colour-light type giving three or four aspects. Two of the signal boxes will be closed, while the remaining one will be retained, with its miniature lever frame controlling the points as at present, the semaphore signals being, however, replaced by colour lights. The control of trains over the entire area of the scheme will be by means of electrical circuits in the running rails which give visual indications in the signal boxes. At Edinburgh the existing mechanically worked signal box at the east end of Waverley Station is to be superseded by a new cabin immediately opposite on the south side of the yard. The existing box has 260 levers, and was for a time remarkable as having the highest number of levers in one continuous frame. The existing Abbeyhill cabin is to be closed. The whole of the lines between the east end of Waverley Station and St. Margarets and London Road signal boxes respectively will be completely track-circuited as at Newcastle, and colour light signals of the multi-unit type fitted with side and back lights are to be provided. Double-sided route indicators will be installed to inform drivers which platform line they are to occupy. The lever frame to be installed in the new cabin will contain 207 miniature levers, and electrical train describers will operate between the new cabin and St. Margarets and

Electrolytic Corrosion of Wiring

CONSIDERABLE trouble and expense have been occasioned in German wiring installations by corrosion due to electrolytic action between conductors and conduits in the presence of moisture formed by condensation. According to a report on the subject by W. Wieseler in *E.T.Z.* (Volume 57, page 1345), this trouble arises in large buildings, offices, warehouses, and the like, where the wiring is drawn into conduit laid in pumice-concrete flooring. The " NGA " wires concerned have tinned conductors with at least two layers of vulcanised rubber, taped and braided. Investigations have been directed towards preventing the collection of water in the conduits and towards preventing the destruction of the wiring by moisture. The presence of the water is due to condensation and it is impossible in practice to prevent its formation in the space between wiring and conduit.

The destructive action of the water is due to electrolytic corrosion. Evidence confirming this was obtained in a large warehouse where all the service lines—water and sprinkler pipes, electric lighting, power and heating cables, fire-alarm and signalling circuits—were laid in a pumice-concrete floor without special protection for the pipes and conduits. After about eighteen months the sprinkler pipes began to leak, trouble occurring first with these because a pressure of 45-60 lb. per sq. in. was maintained inside the pipes, and directly leakage began the pressure was increased by the automatic electric pumping equipment. The pipes were found to be pitted externally in craters from $\frac{3}{4}$ to $\frac{9}{16}$ in. wide with perforations about $\frac{1}{4}$ in. in diameter.

Differences of potential up to 0.3 V were measured between various points in the service pipes and conduits. The insulation resistance of the lighting, heating and power wiring was found to be generally satisfactory, and the fact that the pipe voltages persisted when the main switches were open proved that they did not originate from the electricity supply. It was also ascertained that the pipe voltages were not due to leakage from telephone, fire-alarm and signalling circuits, or to stray currents from an adjoining tramway system.

On the other hand, tests with experimental blocks of pumice-concrete containing pipes of different materials showed e.m.f.'s as follows:—

	Copper against.	Iron against.
Galvanised iron	0.02 V.	0.04 V.
Lead-covered iron ...	0.28	0.2
Bare iron	0.02	—

Further tests, with pipes dipping in water, as used for mixing the concrete, gave e.m.f.'s of 0.56, 0.2 and 0.24 V between copper and galvanised iron, lead-covered iron and bare iron respectively, and an e.m.f. of 0.06 V between iron and lead-sheathed iron.

No explanation is offered as to the inconsistencies between the two sets of readings, but it is clear that the e.m.f. available is often sufficient to cause corrosion by galvanic action. This action accounts for the detinning, roughening and reduction of section of the damaged wiring, the copper conductor and iron conduit forming the electrodes and condensed moisture the electrolyte. The remedies recommended are the use of rubber or vulcanite sheathing on pipes and conduits, and perfectly moisture-proof protection of conductors.

London Road boxes, respectively. The installation at Edinburgh is to be carried out by the Siemens & General Electric Railway Signal Co., Ltd., and will be completed next year. The Newcastle installation will also be carried out by contract and will take about three years to complete; the latter work is being undertaken under the Government scheme. The company has recently carried out an extensive signalling scheme of a similar nature at Galashiels and the vicinity. A new signal box has been brought into use at Galashiels Station, from which are controlled the signals, points, &c., of the area between Kilnknowe Junction and Selkirk Junction.

In addition to these schemes, the company has recently placed with the Westinghouse Brake & Signal Co., Ltd., a contract for the resignalling of the Northallerton-Darlington line. This contract includes the supply and installation of searchlight signals over seventeen miles of line, of which approximately fourteen miles include complete power signalling on two, three and four tracks, with a.c. track circuiting throughout, and also resignalling at Northallerton and Darlington South.

Wolverhampton.—NEW TROLLEY-BUS DEPÔT.—The Corporation has authorised the transport manager to arrange for the construction of the necessary overhead equipment in connection with the new depôt at Park Lane.

Communications

France.—TELEPHONE LINE BETWEEN BELGRADE AND PARIS.—Successful trials have just been made with the new direct telephone line between Belgrade and Paris, reports *Reuter's Trade Service* from Paris. A submarine cable has been laid from Icalo, on the Dalmatian coast, to Tunis and Marseilles. The laying of the cable was financed and guaranteed by the French Ministry of Posts, Telegraphs, and Telephones. An overhead line has been erected between Icalo and Belgrade by the Yugoslav Post Office. The new line and the telephone exchange at Icalo will probably be inaugurated next month.

Great Britain.—NEW STATIONS.—The British Broadcasting Corporation announces that two additional transmitters are to be built and that various adjustments of wave-lengths will be made in the case of some existing transmitters. The separation of the regional services for Wales and the West of England has already been partly effected by the formation of two self-contained organisations, but hitherto the shortage of wave-lengths has prevented the provision of separate transmitters and therefore separate programmes. Recent progress in the synchronisation of transmitters on the same wave-length has now made it possible to evolve a plan to bring this about. Next July the Scottish National programme transmitter will be synchronised with the London and North National programme transmitters on 261.1 metres. The wave-length thus released will be used temporarily by the present National programme transmitter at Washford to provide a separate West Regional programme to those listeners in the West of England who now take their Regional programme from the Washford transmitter on 373 metres. The latter will then become the separate Welsh Regional transmitter. Construction of the first of the two new transmitters will be begun shortly. It will work on high power and will be situated in South Devon, serving the South Coast and South-west England. When ready for service it will take over the wave-length of 285.7 metres. The site of the second transmitter has not yet been definitely decided. This will be a medium-power relay station working on the wave-length at present used by Bournemouth and Plymouth. It will serve Bristol and certain areas in North Devon and Somerset not covered by the new transmitter to be built in South Devon. From February 1st, North Wales will be served by the new transmitter at Beaumaris, which will be called Penmon and will use the same wave-length (373 metres) as the Regional transmitter at Washford and radiate the same programme.

Northern Ireland.—TELEPHONE CONSTRUCTION PROGRAMME.—The Northern Ireland telephone service is to be considerably extended this year. New underground cables will link Belfast with Londonderry and Newry, and these should result in fewer breakdowns during rough weather. Automatic exchanges will be installed in Londonderry and Lisburn. It is hoped that before the summer every village with a post office will also have a kiosk, and altogether 150 kiosks will be installed, of which many have already been put up.

Russia.—MOSCOW.—The entire telephone system of Moscow will be transferred to automatic exchanges during the course of the current year. Five with 10,000 lines each will be equipped to replace the present manual exchanges. Two are now being completed. During the course of this year the telephone systems of Leningrad, Kiev, Erivan, and Smolensk are also to be considerably enlarged. New telephone exchanges are being built in twenty towns. In Leningrad three district automatic exchanges are now being built; in Kiev a second exchange for 10,000 lines is under construction.

Tramways and Trolley-buses

THE Return of Tramways and Light Railways (Street and Road) and Trolley Vehicle Undertakings issued by the Ministry of Transport (Stationery Office, 2s. 6d.) relates to the year ended December 31st, 1935, for companies, and March, 31st, 1936, for local authorities. It does not include the London Passenger Transport Board in the financial and statistical tables which make up forty-eight of the fifty-five pages of matter.

At the beginning of the period under review 96 tramway undertakings, exclusive of the L.P.T.B., were in operation, but only 85 were open for traffic at the end, trolley-buses having been substituted in St. Helens and in Doncaster (the latter in conjunction with motor-buses).

Capital expenditure on tramways amounted to about £56 million, of which nearly £50 million was by local authorities. Gross receipts were approximately £14 million and working expenses £11 million. Local authority undertakings received £73,000 from local rates and contributed £165,000 to relief of rates. Net income from tramways amounted to £3,200,000, of which £615,000 was appropriated for interest and dividends, £1,173,000 for debt repayment and £1,125,000 for reserve and renewals. All the 78 tramways owned by local authorities earned income.

Route miles open for traffic at the end of the period declined by 95 to 1,201 (local authorities 1,050 miles); this distance corresponds to 2,185 miles of track and 105 miles of sidings and depôts. Less than two-thirds of the mileage was at the standard gauge of 4 ft. 8½ in. and the total route miles included about eight of steam and one of cable systems.

Passenger journeys, at an average fare of 1.3d., numbered 2,543 million, a decrease of over 4 per cent., which applied also to the 219 million car miles run. Car miles per car hour worked out at 8.61. Some 520 million kWh was used, being 2.38 per car mile. In the preceding year the figures were 524 million and 2.31, respectively.

In addition, for the year ended June 30th, 1936, the L.P.T.B. worked 284 route miles, compared with 324 in the previous twelve months, and originated 983 million passenger journeys, compared with 1,013 million.

A Bournemouth tramway converted to operation by Sunbeam-B.T.H. trolley-buses

Trolley-vehicles were operated by twenty-seven local authorities (an increase of one) and five companies at the end of the period, exclusive of the L.P.T.B. Twenty-three other local authorities possess powers, Blackpool and South Shields Corporations having acquired the rights to operate trolley-vehicles during the year. Newcastle-on-Tyne started operation on October 1st, 1935, but York Corporation substituted motor-buses in January of that year.

Capital expenditure totalled £4,710,000, of which £3,478,000 was incurred by local authorities. Gross receipts were £2,209,000 and working expenses £1,609,000, giving an operating ratio of 72.83 per cent., as against 79.96 for tramways. Of the net receipts of £600,000 interest and dividends accounted for £91,000 and redemption of debt £208,000.

Route miles open for traffic aggregated 381 (288 local authority) and passenger journeys 376 million (local authority undertakings, 320 million), vehicle miles 38 million and vehicle-miles per vehicle-hr. 9.46. Trolley-buses consumed 81 million kWh, at 2.15 kWh per vehicle mile, compared with 65 million and 2.07 in the preceding year.

In addition, the L.P.T.B. operated trolley-vehicles over 61 route miles and originated 70 million passenger journeys. The figures for the preceding year were 18 and 28 million.

Comprehensive technical and financial particulars are given in tabular form for each undertaking.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Australia.—MELBOURNE.—February 9th. State Electricity Commission of Victoria. One 37,500-kVA outdoor type transformer, with spare coils and bushings. (T. 31045.)*

Birmingham.—February 5th. Electric Supply Committee. A.c. and d.c. distribution boards. (See this issue.)

Bishop's Stortford.—February 8th. U.D.C. Duplicate sets of electrically driven horizontal turbine pumping plant with incidental works. Surveyor, Council Offices (deposit £2 2s.).

Blackpool.—January 26th. Borough Council. Annual supply of various stores and materials. (January 15th.)

Bristol.—February 8th. Corporation. 6.6-kV and 11-kV transformers. (See this issue.)

Bury.—January 30th. Corporation. Thermostatically controlled fire detectors and alarms in the Market Hall. P. H. Lawson, markets superintendent, Market Hall.

Cardiff.—February 8th. R.D.C. Electricity Department. Supplies during one year. (See this issue.)
January 27th. King Edward VII Welsh National Memorial Association. X-ray equipment for the West Wales Sanatorium, Llanybyther, Carmarthenshire. F. J. Alban, secretary, Memorial Offices, Westgate Street.

Colwyn Bay.—February 1st. Electricity Department. Cables, two transformers, two kiosks complete with transformer and switchgear, and one l.v. switchboard. (January 8th.)

Edinburgh.—February 15th. City Council. Pneumatic ash handling plant for the Portobello generating station. (See this issue.)
January 23rd. Corporation. Electric lighting and power in West End police station buildings, Torphichen Place. Engineer's Office, Dewar Place (deposit £1 1s.).

Egypt.—CAIRO.—February 3rd. Ministry of Public Health. Automatic time switches, meters, cut-outs, transformers, cables, boxes and lanterns. (T. 31049.)*

Erith.—February 12th. U.D.C. Electricity Department. Dismantling and removal from site and making good of site, of 1,180 yds. of overhead line. (See this issue.)

Fife.—February 1st. County Council. Electric lighting at forty-four houses at Blairhall. C. R. Douglas & Son, surveyors, 15, East Port, Dunfermline (deposit £1 1s.).

Gainsborough.—February 5th. U.D.C. Electricity Department. Cable, meter boards and joint box compound for twelve months. (January 8th.)

Halifax.—February 9th. Light, Heat & Power Committee. 150,000-kVA, 6,600-V, duplicate bus-bar metal-clad switchgear, steel control panels, turbine telegraphs and other control-room apparatus. (January 15th.)

Hastings.—January 26th. Borough Council. Electrical materials for twelve months. (January 8th.)

Heston & Isleworth.—February 3rd. Borough Council. Electrically driven tower wagon. (See this issue.)
February 15th. Electrical supplies for twelve months. (See this issue.)

Hornchurch.—January 23rd. U.D.C. Telegraphic street fire alarm system. (January 8th.)

Hull.—February 5th. Transport Department. Various stores, including carbon brushes for traction motors, during twelve months. J. Lawson, general manager, Transport Offices, Ferensway.

India.—NEW DELHI.—February 13th. Stores Department. Meter testing apparatus. (T.Y. 31066.)*
February 5th. Bombay, Baroda & Central India Railway Co. Motor-driven vertical air compressor. (January 15th.)

Kettering.—February 19th. U.D.C. Electricity Department. Transformer, cables and a.c. meters. (See this issue.)

Kingston-upon-Thames.—February 3rd. Borough Council. Supplies for twelve months. (See this issue.)

Kirkcudbright.—January 30th. County Council. Electrical work in eighteen houses. County Offices.

Lanark.—County Council. Electric lighting in 238 houses at Stepps. Particulars from P. C. Smith, County housing and town planning engineer, 13, Clydesdale Street, Hamilton, by January 26th.

Leeds.—January 25th. Housing Committee. Various works, including electrical, for maintenance repairs on housing estates and miscellaneous properties. R. A. H. Livett, housing director, 26, Great George Street.

London.—HAMMERSMITH.—January 27th. Borough Council. Electrical stores for twelve months. (January 8th.)
BETHNAL GREEN.—January 25th. Borough Council. Electrical materials. (January 8th.)
HACKNEY.—January 27th. Borough Council. Electrical installation in a block of fifty flats at Shacklewell Lane, E.8. (January 8th.)
BATTERSEA.—February 3rd. Borough Council. Electrical stores for one year. (January 15th.)
POPLAR.—February 10th. Borough Council. Stores for twelve months. (See this issue.)
STEPNEY.—February 2nd. Borough Council. Electric lighting and heating installation in the Public Library, Mile End. Borough engineer and surveyor, Municipal Offices, Raine Street (deposit £5).

Manchester.—January 28th. Electricity Committee. Domestic electric cookers for twelve months. (January 15th.)

Middlesex.—February 22nd. County Council. 1,000-mA X-ray unit and associated equipment and modification of existing apparatus at the West Middlesex County Hospital, Isleworth. (See this issue.)
February 20th. Electric lighting and power installations, cables, switchgear, road lighting, call bells, telephones, clocks, staff locaters and replacement of d.c. distribution system and apparatus by a.c. equipment at the Central Middlesex County Hospital. (See this issue.)

Newcastle-upon-Tyne.—January 25th. Transport and Electricity Committee. Tubular tramway poles and cadmium trolley wire. T. P. Easton, general manager, Transport and Electricity Undertaking, Manors (deposit £2 2s. each).

New Zealand.—DUNEDIN.—February 24th. Tramways Department. Trolley wire. (T.Y. 31078.)*

Oban.—February 1st. Town Council. Electric lighting in sixty-four houses. D. Galloway, burgh surveyor.

Plymouth.—February 6th. Corporation. Cables, meters, time switches and wireless rectifiers. (See this issue.)

Rotherham.—January 23rd. Borough Council. One 3-ton electric crane with floor control, one 20-cwt. transporter-bridge with electric travel, one 20-cwt. two-motor electric hoist and overhead runway and curves. T. P. Sykes, Transport Department, Municipal Buildings.

South Africa.—PRETORIA.—February 12th. Union Tender and Supplies Board. Telegraph and telephone line material. (T. 31062.)* Twenty-six motor-driven generators. (T.Y. 31063.)*
February 26th. Fifteen stationary batteries. (T.Y. 31081.)*
CAPETOWN.—February 24th. Electricity Department. Miniature circuit-breakers for house service connections. (T.Y. 31091.)*
JOHANNESBURG.—February 13th. City Council. Transformers. (T. 31084.)*

Southend-on-Sea.—February 2nd. Corporation. H.v. and l.v. underground cables for two years and a section of overhead h.v. line. (January 15th.)
February 4th. Electrical stores for twelve months. (January 15th.)

Stoke-on-Trent.—February 3rd. North-West Midlands Joint Electricity Authority. Outdoor type static transformers and electricity meters. (January 15th.)

Stretford.—January 26th. Borough Council. Twelve months' supply of materials, including electric lamps (Ref. No. 6). Town clerk, Town Hall.

Torquay.—February 5th. Corporation. Twelve months' supply of electric lamps. Borough engineer.

Tredegar.—January 26th. U.D.C. 2,000 yd .of 3-wire, 11-kV wood poles, overhead line of galvanised steel conductors, 250 yd. of 3-core 0.04 h.p. cable, and one 50-kVA outdoor type transformer. W. Davies, electrical engineer, Bedwellty House (deposit £1.)

Tynemouth.—February 1st. Corporation. Cables. (January 8th.)

West Lothian.—February 6th. County Council. Electric lighting installation in 222 houses. F. Smith & Brown, 4, Regent Street, Hamilton.

West Riding.—January 25th. Standing Joint Committee. Electrical work at alterations to the Keighley police station. West Riding architect, County Hall, Wakefield.
January 30th. Public Assistance Committee. Electrical wiring in connection with the installation of calorifiers, pumps, motors, &c., at the County Public Assistance Institution, Batley. P. O. Platts, architect, County Hall, Wakefield.

Wimbledon.—January 25th. Corporation. Cables. (January 15th.)

Winchester.—February 12th. Electricity Department. Underground cables during thirteen months. (See this issue.)

Worsley.—January 23rd. U.D.C. Fittings, including electric wash-boilers, for sixty-six houses and bungalows on the Ash Street and Old Clough Lane estates. J. Howard, engineer and surveyor, Town Hall, Walkden.

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 33, Old Queen Street, London, S.W.1.

Contracts Closed

Annan.—Town Council. Accepted. Installation of electric lighting in sixteen houses at Rogermoor (£158).—A. & C. Edelman, Ltd.

Bedford.—Electricity Committee. Recommended. Oil circuit-breaker (£212).—English Electric Co.

Cardiff.—Electricity Committee. Accepted. Switchboard (£280) and switch unit (£107).—Ferguson, Pailin.

Coulsdon.—Property Committee. Accepted. Telephone installation at Council Offices (£536).—Reliance Telephone Co.

Darlington.—Town Council. Accepted. Electric lift at the Municipal Institution.—Pickerings, Ltd.

Eccles.—Education Committee. Accepted. Electrical installations at Winton school (£1,298).—E. M. Evans & Sons.
Electricity Committee. Accepted. 500-kVA transformer (£299).—Electric Construction Co.

Fife.—County Council. Accepted. Electric lighting at housing estates.—R. Aitken & Co. (£998); T. S. Miller (£397); J. Scott & Co. (£255). Electric lighting at the Tayport Higher Grade school (£278).—Moncrieff Bros.

London.—ISLINGTON.—Electricity Committee. Recommended. Electric cookers.—Hotpoint Electric Appliance Co.; Jackson Electric Stove Co.; Falk, Stadelmann & Co. Steel lamp columns.—Bromford Tube Co. Electric discharge lanterns, complete with lowering gear.—Revo Electric Co. Auto-switchgear controls.—Radiovisor Parent, Ltd.

L.C.C.—One electric motor-driven hydro-evtractor in the laundries of the Hackney, St. Alfege's and St. Pancras Institutions and the Lewisham, St. Clement's, St. Nicholas' and St. Peter's Hospitals:

	£	
Manlove, Alliot & Co. ...	*1,365	* Subject to an abatement of 2½ per cent. on each machine in the event of acceptance of tender in respect of all institutions and hospitals.
T. Broadbent & Son ...	*1,534	
Watson, Laidlaw & Co.	1,600	

ST. PANCRAS.—Contracts and Stores Committee. Recommended. L.v equipments for three sub-stations (£887 each).—English Electric Co.

Motherwell and Wishaw.—Town Council. Accepted. Electric lighting installation at 148 houses (£1,836).—Stephen Harvie.

Paisley.—Electricity Advisory Committee. Accepted. Feeder pillars (£228).—Henley's.

Portsmouth.—Electricity Committee. Accepted. Cooker control units.—J. H. Tucker & Co. Switch fuses.—G.E.C. Transformers.—British Electric Transformer Co.; Hackbridge Electric Construction Co.; G.E.C. Cables.—W. Geipel; G.E.C.; Metropolitan Electric Cable & Construction Co.; Hackbridge Cable Co.; General Cable Manufg. Co.; Mersey Cable Works; Telegraph Construction & Maintenance Co.; Johnson & Phillips; Edison Swan Cables; Derby Cables.

St. Andrews.—Town Council. Accepted. Electrical fittings in eighty-two houses (£522).—R. Bell.

Forthcoming Events

Institution of Electrical Engineers.—Monday, January 25th. Institution, London, W.C.2. 7 p.m. Informal meeting. Discussion on "Industrial Temperature Control." To be opened by Mr. D. B. Williamson.

Hampshire Sub-Centre.—Friday, January 22nd. South-Western Hotel, Southampton. Annual conversazione and dance.

North-Eastern Centre.—Monday, January 25th. Armstrong College, Newcastle-upon-Tyne. 6.15 p.m. "The Effects of Impulse Voltages on Transformer Windings." Messrs. T. E. Allibone, D. B. McKenzie and F. R. Perry. Friday, January 29th. Old Assembly Rooms, Newcastle-upon-Tyne. 7.30 for 8 p.m. Annual dinner and dance.

South Midland Centre.—Monday, January 25th. James Watt Memorial Institute, Birmingham. 7 p.m. Informal meeting. Discussion on "Electricity Distribution."

Scottish Centre.—Tuesday, January 26th. North British Station Hotel, Edinburgh. 7 p.m. Informal meeting. "Rural Communications—Small Automatic Exchanges and Line Construction." Mr. H. T. Millar.

Wireless Section.—Tuesday, January 26th. Institution, London, W.C.2. 6.30 p.m. Informal meeting. Discussion on "What Performance is Desirable in Broadcast Receivers, with Special Reference to Automatic Devices." To be opened by Mr. A. H. Cooper.

West Wales (Swansea) Sub-Centre.—Thursday, January 28th. Grand Hotel, Swansea. 6 p.m. "The Prices for Electric Supply." Prof. Miles Walker. 8 p.m. Dinner.

Electrical Contractors' Association.—Tuesday, January 26th. Savoy Hotel, London, W.C.2. 6.30 for 7 p.m. Annual dinner.

Electrical Power Engineers' Association (*London Technical Group*).—Tuesday, January 26th. Caxton Hall, London, S.W.1. 7.15 p.m. "Steam Line Joints." Mr. W. B. Shannon.

Royal Institution.—Tuesday, January 26th. Institution, London, W.1. 5.15 p.m. "Electrical Conductivity in Solids." Mr. N. F. Mott.

Royal Society of Arts.—Wednesday, January 27th. John Street, London, W.C.2. 8.15 p.m. "Luminescence and its Applications." Mr. J. T. Randall.

Institute of Wireless Technology.—Thursday, January 28th. 4, Vernon Place, London, W.C.1. "The Detection and Suppression of Radio Interference." Mr. F. W. Newson.

Electrical Engineers' Dance.—Friday, January 29th. Grand Hotel, Harrogate. 8 p.m.

Electrical Trades' Commercial Travellers' Association.—Friday, January 29th. Connaught Rooms, London, W.C.2. 6.30 for 7 p.m. Annual dinner.

Junior Institution of Engineers.—Friday, January 29th. 39, Victoria Street, London, S.W.1. 7.30 p.m. Informal meeting. "The Sunbury Cathode Ray Engine Indicator." Capt. McGilliwie and Mr. R. Stansfield.

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

India rubber insulation for refrigerator work made in half sections for clamping on copper tubing.

LEWIS adjustable brake.

STOKES water distilling plant.

FURNACE electric fires.

Readers should enclose stamped addressed envelopes when making their inquiries.

Notes

I.E.E. (Western Centre) Dinner

The silver jubilee dinner of the Western Centre of the Institution of Electrical Engineers was held at the Royal Hotel, Bristol, on Monday, when nearly 200 members and guests assembled under the presidency of Mr. J. W. Spark (chairman of the Centre). Sir Felix Pole, in proposing the toast of "The Institution," congratulated Mr. H. T. Young on obtaining the blue riband of his profession, and said that while much had been accomplished in electrical development there were still greater fields of approach. The lighting of public highways by electricity still left much to be desired. Responding, Mr. Young (president of the I.E.E.) referred to the work which was being accomplished by the Electrical Association for Women. He visualised enormous developments in electricity within the next ten years. Regarding railway electrification, he said a service from Paddington to Bristol was a distinct possibility. The "Visitors and Guests" was proposed by Mr. Weaver and responded to by Councillor W. F. Long (Mayor of Bath and chairman of Bath Electricity Committee) and Miss Caroline Haslett (director of the E.A.W.). Replying to the toast of "The Chairman," proposed by Mr. R. Hodge, Mr. J. W. Spark referred to the criticism which had been levelled against the Western Centre in the provision of facilities for members to meet. An endeavour had been made to overcome this by holding meetings in places other than the sub-centres, and the attendance at these meetings would determine the necessity or otherwise of establishing further sub-centres. The dinner was followed by dancing.

Students' Dance

Last Friday the students of the Institutions of Electrical, Civil and Mechanical Engineers once again joined forces at the Victoria Halls, Southampton Row, London, W.C., for their annual joint dance. Always a jolly affair, there was again a large attendance which spread itself over the two halls. Mr. L. E. Maddams, assistant entertainment secretary of the I.E.E. Students' Section, acted as M.C.

I.E.E. Graduateship Examinations

The results of the graduateship examinations held by the Institution of Electrical Engineers in November, 1936, show that twenty-seven candidates passed the whole examination (including those partly exempt) while twenty passed Part I only and eight passed Part II only.

Nickel Ore Mining

It is reported in the *Chemical Trade Journal* that the Petsamo Nickel Company, which is developing the nickel deposits of the Kaulestunturi district of Finland, is making good progress. It now proposes to build an electric railway between the mines and the port of Linaharami, and also to erect electric power works. It is hoped to ship some 400,000 tons of ore for refining at Clydach in the not too distant future.

Electrical and Chemical Industries

At the annual dinner in Manchester this week of the North-Western Centre of the Institution of Electrical Engineers Lord Melchett made a plea for greater co-operation between the electrical and chemical industries. He was supported by Mr. H. T. Young, president I.E.E., Alderman J. Toole, the Lord Mayor of Manchester, and other speakers. Lord Melchett said that the chemical and electrical industries were already in touch at many points, and particularly in metallurgy. Plastics was doing much to bring about closer contact, while on the research side the wonderful work of Lord Rutherford was only possible electrically. Further interchange of ideas was essential to future progress. All learned societies should try to appreciate and play a part in solving the outstanding problems of to-day—world depression. Another world depression could produce results worse than war itself.

Mr. Young said that the electrical industry also felt that the peaks and valleys of industry should be flattened out in some way nationally. By such schemes as soil heating, for example, the electrical man could give great support to the chemical engineer in his efforts to grow better crops. The chairman, Mr. G. L. Porter, saw electricity as a crusade against such things as smoke and drudgery. Mr. J. W. Thomas, LL.B., proposed the health of the chairman.

Appointments Vacant

Borough electrical engineer for Stafford.

Installation inspector and meter repairer for Radcliffe Electricity Department.

Examiners in the w/t and instrument sections of the Air Ministry (Aeronautical Inspection Directorate).

Probationary assistant engineers in the Post Office Engineering Department.

Electrical testing assistant at the Royal Air Force Establishment, Dhibban, Iraq.

Meter repairer and tester for Kirkcudbright County Council.

Lady demonstrator and showroom assistant for Nelson Electricity Department.

Meter repairer and tester for Torquay Electricity Department.

Power station operation engineers for the Madras Electric Supply Corporation, Ltd.

Assistant sub-station attendant for Barking Electricity Department.

(See our classified advertisements.)

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Lord Hirst has consented to continue as president of the Federation of British Industries for a second year, which commences in April. At a recent meeting of the Grand Council it was represented to him that as the year ahead promised to be one of exceptional importance, with inter-Imperial trade questions arising for settlement during the summer, the continuity in office of one possessing his special knowledge and other qualifications was greatly to be desired. Lord Hirst not only represents British manufacturing interests, but is peculiarly able to give counsel in future negotiations with the Dominions. The president, in expressing thanks for the honour conferred upon him, promised to do everything in his power to further the interests of British industry.

[*Elliott & Fry.*

Lord Hirst

Mr. J. Little, of Whitehaven Corporation, has been appointed assistant mains engineer with the Morley Corporation Electricity Department at a salary of £300 per annum.

Mr. W. J. Parslow (general manager) and **Mr. A. Sewell** (sales manager) have been appointed to the board of Tecalemit, Ltd. There will be no immediate appointment of successors to the executive posts previously occupied as the new directors will continue to carry out the duties concerned in each case.

Mr. J. W. D. Cook

Mr. J. W. D. Cook, chief assistant engineer in the Nuneaton Corporation Electricity Department, has been appointed borough electrical engineer at Barnstaple in succession to Mr. J. W. Hadfield, who retires in March next. Mr. Cook was educated at Reading Grammar School and served as pupil to Mr. G. F. Craven, transport manager and borough electrical engineer, Reading. Subsequently he was appointed assistant engineer at Aylesbury and later became distribution engineer. In 1928 he was appointed technical assistant at Nuneaton and three years later was promoted to his present position of chief assistant engineer.

Mr. T. Pickles, B.Sc., who is on the staff of the Burnley Corporation Electricity Department, has been appointed technical assistant in the mains section of Ilford Corporation Electricity Department. Mr. Pickles was articled to Mr. Starkie, Burnley electrical engineer, and subsequently was appointed to the staff. He secured his B.Sc. (Engineering) degree in the external examinations of London University. Since 1935 he has been assistant instructor in the Engineering Department of Burnley College.

Mr. H. Muscroft, manager of the South Shields Corporation Electric Tramways and Motor Omnibuses Department, has been appointed general manager of the Southend-on-Sea Corporation Transport Department, at a salary of £750 per annum, rising to £950, plus a car allowance of £80 per annum.

Mr. Muscroft is a native of Bradford, where he held the position of assistant to the chief engineer until his appointment at South Shields.

Mr. H. Muscroft

Mr. W. A. Ward, M.I.Mech.E., late with Simon Carves & Co., as chief engineer of the boiler department, has joined the board of Bennis Combustion, Ltd., and will now act as their general manager.

Obituary

Sir J. A. F. Aspinall.—The death occurred on Tuesday last at Woking, at the age of 85 years, of Sir John A. F. Aspinall, M.Inst.C.E., M.I.Mech.E., the well-known railway engineer. In the course of a very distinguished career he spent many years in the service of the Lancashire and Yorkshire Railway, first as chief mechanical engineer and later as general manager. It was in the latter capacity that he was responsible for the adoption of electric traction for some of the suburban services of the L. & Y. system, the first line electrified being that from Liverpool to Southport in 1904. In 1919 he retired from the company's board to take up the appointment of consulting mechanical engineer to the Ministry of Transport, which position he held until 1927. He was president of many engineering institutions and contributed numerous papers on railway engineering.

Mr. F. C. C. Nielsen.—The death occurred on January 13th, at 198, Ashley Gardens, Westminster, of Mr. Frederik Carl Christian Nielsen, R.D., D.M. Mr. Nielsen, who was in his eighty-sixth year, was for many years London manager of the Great Northern Telegraph Co., Ltd. (of Copenhagen), and was well known in submarine and other telegraph circles in this country.

Monsieur P. Launay.—The death recently occurred in Paris, at the age of forty-six years, of M. Pierre Launay, director of the Water-power and Electric Power Distribution Department of the French Ministry of Public Works.

Mr. C. Streatfield-James.—The death is reported of Mr. Charles Streatfield-James, late Director, Indian Telegraphs, which occurred on January 15th at his home at Churchdown, Glos.

Mr. E. H. Green, chief electrical engineer to Mr. J. Stinton Jones, consulting engineer, died on January 17th. He has been succeeded by Mr. G. W. S. Levey as chief electrical engineer.

In the Courts

Radio Patent Action

In the Chancery Division on January 7th Mr. Justice Luxmoore reserved his judgment in the action brought by the British Thomson-Houston Co., Ltd., Marconi's Wireless & Telegraph Co., Ltd., and Electric & Musical Industries, Ltd., against the Guildford Radio Stores and E. K. Cole, Ltd., for an injunction (and the usual ancillary relief in a patent action) to restrain them from infringing the plaintiffs' letters patent No. 248731 of 1925 and granted to the first-named plaintiffs for an invention for "Improvements in thermionic valve-amplifying systems" for use in connection with radio-receiving apparatus. The second- and third-named plaintiffs were tenants in common in the patent.

The defence was a denial of the alleged infringement and a plea that the plaintiffs' letters patent were invalid by reason of prior publication and prior common general knowledge. Defendants counterclaimed for revocation of the letters patent.

Mr. Trevor Watson, K.C., replying for the plaintiffs, said they had never suggested for a moment that if a person were desirous of making a high-resistance moving-coil loudspeaker it would not be within the capacity of a designer to do so. The plaintiffs' point was that in 1925 no person would ever have dreamed of doing such a thing unless he had met with the plaintiffs' invention first.

Claim for Installation Work

Mr. C. M. Pitman, K.C., the Official Referee, on January 14th concluded the hearing of an action brought by Sedgley & Edgeley, electrical engineers, Walton-on-Thames, to recover from Mrs. Laura A. Willson, Walton-on-Thames, a balance of £102 11s. 3d., of the price of work done and materials supplied in connection with electrical installations in a building estate known as Walton Grove, of which the defendant was the owner.

The defendant resisted the claim on the grounds that the plaintiffs had overcharged in certain cases and had charged for goods not supplied and for work not ordered. This the plaintiffs denied.

After hearing the evidence the Official Referee held that the plaintiffs were entitled to recover £96 0s. 9d. from the defendant, and gave judgment for them for that amount.

B.T.H. Co. v. Crompton Parkinson

In the Chancery Division on Tuesday Mr. Trevor Watson, K.C., applied to Mr. Justice Luxmoore that the action brought by British Thomson-Houston Co., Ltd., against Crompton Parkinson, Ltd., should be directed to stand out of the list for hearing until the next sittings. He said it was a very heavy case involving large interests, and there was at the present moment a considerable prospect that the case might be settled; but the negotiations involved not only matters with which the action was concerned, but other matters of considerable magnitude affecting a large number of parties. As the result of this the negotiations were likely to be protracted.

Sir Stafford Cripps, K.C., for the defendants, assented to the application and his Lordship said that the action would not be taken during the present sittings.

New Books

The Welding and Cutting Year Book, 1936/7. Edited by C. HELSBY, C. W. HAMANN and F. J. SAMUELY. Pp. 244; figs. 143. London: Temsbank Publishing Co. Price 5s.

The authors have done their best to keep pace with the rapid developments taking place, and in their first chapter explain a few of the latest achievements in the different branches of engineering. This rather savours of putting the cart before the horse—showing us the finished product before explaining how to set to work. The second chapter, on acetylene welding and cutting, contains much useful information regarding the different techniques to be employed to meet the varying conditions in the welding shop and out of it.

Chapters are devoted to electric-arc, atomic-hydrogen and thermit welding, and also to resistance welding and other methods of joining metals. The photo-micrographs in the section on the metallurgy of steel are good and assist very much towards a clear understanding of the basic principles. This is followed by detailed instructions for the welding of stainless steels, cast iron and non-ferrous metals. We like the way in which the metallurgical information is brought forward. Authors of welding books so frequently neglect this side of their writings and rarely handle it so competently.

The chapter on the mechanics of welds is very enlightening. Here are discussed the general design, the type of joint best suited to the service expected, and the economics of welds and joints. The book finishes with a description of the various tests applicable to metals, joints and structures, and gives some useful tables. Throughout the explanations are clear, and the book should help welding engineers over many awkward stiles.

Hot Water Service. By S. F. GREENLAND. Pp. 189; figs. 27. London: G. A. Philpot, Ltd. Price 12s. 6d.

This publication will be appreciated by every engineer whose work brings him in contact with hot-water installations and water-heating systems of any magnitude. It is copiously provided with useful tables giving information on many points, ranging from physical constants and factors to equivalent frictional data all of which should prove of considerable service.

The many examples set out show evidence of considerable practical experience, but most of them, together with the diagrams, relate only to fuel-fired installations. One cannot help feeling that electric heating would undoubtedly solve many of the problems which are put forward in a much more satisfactory manner.

It is strange to see a comparatively old-fashioned system of domestic hot-water supply receiving any mention other than "how not to do it," the author stating that "overhead-tank systems are usually installed for smaller installations." Most engineers are aware of the drawbacks of this system which was to be found at one time in many old-fashioned London houses. Surely this type of installation, with its flow-tapped draw-off branches, died a natural death with the passing of the pre-war plumber!

Types of boiler receive little mention and electricity even less, in spite of the increasing interest in electricity as a means of heating both water and space and of the considerable number of large-scale installations in use to-day. Nevertheless, for its technical value, every hot-water engineer should have a copy of this work.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Constant Current, Ltd.—Private company. Registered January 12th. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in wireless and television sets, accessories and apparatus, artificial lighting apparatus, electrical fittings, &c. The directors are: C. M. Mills, Clara Mills, and E. Mills, all of 2, Danesway, Pendlebury, near Manchester, and G. Mills, 40, Burnside Avenue, Salford, 6.

Industrial Humidifiers, Ltd.—Private company. Registered January 12th. Capital, £2,000. Objects: To acquire the business of a manufacturer of humidifiers and air conditioning plants carried on by B. Lipton, together with the benefit and right to use and exploit the apparatus described in provisional patent under No. 18034/36, as an improvement in or relating to air humidifying apparatus; to carry on the business of manufacturers of and dealers in electrical apparatus, including humidifiers, air conditioning plants, temperature control apparatus, installations of electric light, heat and power, &c. The directors are: B. Lipton and J. Lipton, both of 44, Middleton Avenue, Hove. Registered office: 47, Great Russell Street, W.C.1.

Cosmo Signs, Ltd.—Private company. Registered January 9th. Capital, £100. Objects: To carry on the business of manufacturers, erectors and maintainers of neon, daylight, box, metal, electric and other signs, advertising specialists, &c. The subscribers are: A. H. Allington and Mrs. E. R. Allington, both of 90, Torriano Avenue, N.W.5. A. H. Allington is a permanent director.

"Peace of Mind" Co., Ltd.—Private company. Registered January 13th. Capital, £100. Objects: To adopt an agreement with B. S. Cooper and L. Bluston for the purchase of the full right and benefit of the provisional patent protection granted to them in respect of an invention for an improvement in signalling or indicating devices, and to carry on the business of manufacturers of and dealers in the aforesaid device, manufacturers of and dealers in gramophones and sound-reproducing machines, picture producing, reproducing or transmitting apparatus, electricians, radio and electrical engineers, &c. The permanent directors are: D. S. Cooper, 450, Watford Way, Hendon, L. Bluston, 6, Leaside Road, Clapton, E.5, and C. Cooper, address not stated. Solicitors: Halliday, Clarke & Co., 39/40, Albemarle Street, W.1.

Wholesale Electrical Supplies (Grimsby), Ltd.—Private company. Registered January 11th. Capital, £1,000 in £1 shares. Objects: To acquire the business now carried on by Arthur S. Phillipson at 160, Oxford Street, Grimsby, as the Wholesale Electrical Supplies, and to carry on the business of electric light and power engineers and contractors, radio engineers, &c. The directors are: A. S. Phillipson (permanent governing director), and H. N. Elvin, both of 13, Melbourne Avenue, Grimsby. Secretary: H. N. Elvin. Registered office: 160, Oxford Street, Grimsby.

Scottish Battery Co., Ltd.—Private company. Registered in Edinburgh January 14th. Capital, £2,500. Objects: To carry on the business of battery makers, &c. The directors are: A. S. Kerr, Whitefarland, Greenock, and G. M. Perry, 27, Ettrick Crescent, Rutherglen. Secretary: A. S. Kerr. Registered office: Field Road, Busby, Scotland.

Adams Bros. (Parkstone), Ltd.—Private company. Registered January 12th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in electrical and mechanical apparatus and accessories, wireless sets, valves, gramophones, &c. The directors are: F. H. Adams and D. A. Adams, both of 12, Rozelle Road, Parkstone. Registered office: 16a, Station Road, Parkstone, Dorset.

Spensers and Wyllie Radio, Ltd.—Private company. Registered in Edinburgh January 11th. Capital, £1,000. Objects: To carry on the business of radio, electrical and general engineers, electricians, electro-platers, &c. The subscribers are: D. McIntosh, "Zeyla," Greenbank Road, Edinburgh; and D. C. Coutts, 1, Dean Park Crescent, Edinburgh.

Shipper's Radio, Ltd.—Private company. Registered January 7th. Capital, £1,000. Objects: To carry on the business of manufacturers of, agents for and dealers in radio receiving sets, radio gramophones and electrical and music sets, &c. The permanent directors are: F. Ryder, 11, Grange Drive, Monton, Lancs; L. Shipper, 9, Hartley Avenue, Prestwich; and T. Rosenberg, 19, Victoria Road, Balby, Doncaster. Solicitor: Jacob Amelan, 78a, Tib Street, Manchester.

Felgate Radio, Ltd.—Private company. Registered December 31st. Capital, £100. Objects: To carry on the business of manufacturers of, agents for and dealers in radiograms, wireless, &c., and to adopt an agreement with the Felgate Radio Co., Ltd. (in voluntary liquidation), and B. F. Hallett, the liquidator thereof. The directors are: F. J. Benzimra, East House, Addison Crescent, W.14, and two others. Secretary: F. J. Benzimra. Registered office: Felgate Mews, Studland Street, W.6.

Radio Services (Essex) Ltd.—Private company. Registered December 23rd. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in radio and television instruments, sets and components, &c. The directors are: T. H. Grylls (permanent), 68, Southend Road, Grays, Essex, and A. W. Moore, 120, Bridge Road, Grays. Secretary: M. B. Jeffs. Registered office: 110, Clarence Road, Grays, Essex.

Returns of Electrical Companies

Bylock Electric, Ltd.—Satisfaction to the extent of £500 on December 31st, 1936, of debentures registered January 13th, 1936, securing £4,500.

Croydon Engineering Co., Ltd.—Satisfaction to the extent of £1,000 on December 31st, 1936, of debentures authorised June 13th, 1929, and registered July 22nd, 1929.

Cheshire Cables, Ltd.—Harvey Longrigg, of Dickinson Chambers, 1, Dickinson Street West, Manchester, ceased to act as receiver and manager on December 18th, 1936.

Cam Electrical, Ltd.—Chas. Latham, of 185-188, High Holborn, W.C.1, ceased to act as receiver and/or manager on January 5th, 1937.

British Relay Wireless, Ltd.—Capital, £5,500 in £1 shares. Return dated October 21st, 1936. All shares taken up. £5,500 paid. Mortgages and charges nil.

Price's Electrical Supplies, Ltd.—Capital, £3,000 in 3,000 shares of £1. Return dated October 9th (filed December 29th), 1936. 1,210 shares taken up. £1,210 paid. Mortgages and charges nil.

Domestic Electrification, Ltd.—Capital, £50,000 in £1 shares. Return dated October 15th, 1936. 40,000 shares taken up. £40,000 paid. Mortgages and charges nil.

British Home & Office Telephone Co., Ltd.—Capital, £10,000 in £1 shares. Return dated November 12th, 1936. 5,230 shares taken up. £5,230 paid. Mortgages and charges nil.

Radenite Batteries, Ltd. (formerly Van Raden & Co., Ltd.).—Capital, £20,000 in £1 shares. Return dated November 16th, 1936. 6,754 shares taken up. £4,654 paid, £2,100 considered as paid. Mortgages and charges nil.

Vaughan Crane Co., Ltd.—Capital, £150,000 in 50,000 preference and 100,000 ordinary shares of £1. Return dated November 3rd, 1936. 16,880 preference and 53,578 ordinary shares taken up. £43,669 paid, £26,789 considered as paid. Mortgages and charges nil.

Elcap, Ltd.—Capital, £700 in 700 shares of £1. Return dated October 27th, 1936. 600 shares taken up. £300 paid, £300 considered as paid. Mortgages and charges nil.

Pollard & Smith, Ltd.—Capital, £2,000 in £1 shares. Return dated October 8th, 1936. All shares taken up. £2,000 paid. Mortgages and charges nil.

Space Heating, Ltd.—T. W. Dresser, of 29, Cookridge Street, Leeds, was appointed receiver on January 7th, 1937, under powers contained in instrument dated May 18th, 1935.

London Electrical Company (Sherborne Lane), Ltd.—The nominal capital has been increased by the addition of £2,000 in £1 ordinary shares beyond the registered capital of £6,000.

Roberne Electrical Supplies Co., Ltd.—Capital, £1,000 in £1 shares. Return dated September 30th, 1936. 530 shares taken up. £50 paid, £478 considered as paid, £2 calls unpaid. Mortgages and charges nil.

Donovan Electrical Co., Ltd.—Capital, £50,000 in £1 shares. Return dated September 30th, 1936. 29,100 shares taken up. £29,100 considered as paid. Mortgages and charges nil.

Metalite Co., Ltd.—Capital, £100 in 100 shares of £1. Return dated November 20th, 1936. All shares taken up. £100 paid. Mortgages and charges nil.

George Hill & Co., Ltd.—Capital, £4,000 in £1 shares. Return dated November 10th, 1936. 2,150 shares taken up. £2,150 considered as paid. Mortgages and charges nil.

Claude B. Barton, Ltd.—Capital, £1,000 in £1 shares. Return dated September 24th, 1936. 900 shares taken up. £900 paid. Mortgages and charges nil.

City Notes

Turner & Newall, Ltd.—Presiding at the annual meeting on January 14th Mr. S. Turner (chairman) referred to the issue during the year of additional shares to the ordinary stockholders. The purposes of the issue included the erection and equipment of two additional factories in India, where their business had grown at such a rate that the first works were no longer sufficient to meet the demand for their products. The Quasi-Arc Co., Ltd., had during the year under review exceeded its previous records in the manufacture and sale of electrodes and welding equipment. The extension of that company's London factory had now been completed. Electric welding in shipbuilding had shown a great increase during the year and the Quasi-Arc Co. had reaped the full benefit resulting from the large tonnage now under construction in British shipyards. A second all-welded gasholder of 2,000,000 cu. ft. capacity was now in course of erection near Manchester. This work was a new field for electric welding. The sales of Newalls Insulation Co. had shown marked progress. In addition to shipbuilding work, they had more than maintained their sales for general purposes, including work executed in power stations and in industrial plants both at home and abroad. Since the close of the financial year they had disposed of the whole of their interest in the Quasi-Arc Co., and had received £170,000 ordinary stock of the British Oxygen Co., Ltd., in exchange.

J. & E. Hall, Ltd., report a trading profit for the year ended September 30th last of £225,770, as compared with £194,285 in the previous year. After deducting directors' fees, general expenses, bad debts, &c., the net profit was £65,195 (against £42,197). The ordinary dividend for the year is 8½ per cent. (against 6 per cent.), and £29,293 is carried forward. The report states that the works were fully employed during the year, and a considerable sum was spent on new machine tools and equipment in order to increase outputs and reduce costs. The output of marine refrigerating installations was satisfactory. Orders for larger sizes of land type refrigerating plants have increased and for the small plants the turnover has been maintained. There has been an increase in the orders received for both lifts and escalators, and orders on the books of all departments are sufficient to enable the directors to take a favourable view of the prospects for the current year.

Companies Struck off the Register.—The names of the following companies have been struck off the Register and they are thereby dissolved:—Cannon Electrical Appliances, Ltd.; Condor Electric Co., Ltd.; Electric Units, Ltd.; Master Radio & Elecl. Co., Ltd.; Neon Star Co., Ltd.; Rex Electric Geysers, Ltd.; S. H. Radio Services, Ltd.; Ultra Modern Radio & Electrical, Ltd.; Universal Electrical Laboratories, Ltd.

Murex, Ltd.—A meeting is being held on January 25th at which proposals will be submitted for increasing the authorised capital to £1,250,000 by the creation of 600,000 new ordinary shares of £1 each and the capitalisation of £400,000 of the general reserve account by the issue as a bonus of 400,000 fully paid ordinary shares of £1 each on the basis of two bonus shares for every three ordinary shares held.

Increases of Capital.—The nominal capital of the following companies has recently been increased to the extent shown:—Peterhead Electricity Co., Ltd., from £5,000 to £35,000; Sussex Electricity Co., Ltd., from £122,200 to £197,000; Salcombe Gas and Electricity Co., Ltd., from £30,000 to £36,000; Seaton and District Electric Light Co., Ltd.,from £30,000 to £50,000; Leominster Electric Supply Co., Ltd., from £23,000 to £28,000.

The Harrow Electric Light & Power Co.—The North Metropolitan Electric Power Supply Co., which already holds 93 per cent. of the share capital of this company, proposes to acquire the whole undertaking.

The Telephone & General Trust is paying the usual half-yearly dividend on the cumulative preference shares of 3½ per cent., less tax.

Stocks and Shares

TUESDAY EVENING.

THE opening of Parliament, on the Tuesday in this week, is taken in the Stock Exchange markets as a prelude to the coming of a Budget which everybody knows is likely to be none too palatable to the tax-payer. The active policy of rearmament upon which the Government have at last embarked is going to be an expensive affair, and although there are not many people who are likely to begrudge money spent on national protection, the cost is likely to make itself felt in a variety of ways. It has, for one thing, already served to bring about substantial improvements in the prices of shares in companies connected in any way with rearmament proposals. It has, during the past few days, laid a hand of restraint upon investment in the gilt-edged securities which, for a long time past, have been in such high favour at such high prices.

The general disposition in the Stock Exchange is for buyers to act cautiously. The spirit of speculation continues to animate a number of the stocks and shares which are enjoying popularity, but a halt has been called to the enterprise which of late has taken shares with both hands, as the saying goes. Prices of commodities and metals are also yielding a little of the ground they recently gained. The inclination on the part of capital is to wait upon the course of events, and, before making further purchases, to see what Parliament is going to do in the matter of its armament policy.

London Electric Transport Loan

Subscription lists for the offer of London Electric Transport Finance 2½ per cent. guaranteed debenture attracted applications for slightly more than the amount of stock available. Business opened at ¼ discount on the issue price of 92½, and has continued at about that level. The effect of the issue on the existing £32,000,000 of the same stock has been to depress the price, which recently went ex-dividend from 93 to 91, or more than a point below that of the new scrip. The comparative attractions of the latter lie in its freedom from stamp duty until the final registration date, nearly a year hence, and in the fact that the bulk of the purchase money will not be called for until early in May. By appropriating a material proportion of the money that was seeking safety-first investment, the issue contributed to a sagging tendency in the prices of most gilt-edged stocks, which were already suffering from lack of support. Talk runs upon the possibility of an early issue of a national Defence Loan. Increase of taxation will doubtless be proposed in the next Budget. There is not much for buyers to "go for" in the immediate outlook for gilt-edged stocks.

Cable and Wireless

The better tendency shown for a week or two in the prices of Cable and Wireless stocks has gathered momentum. Buyers have been coming forward in fair numbers, and have found a reluctance on the part of holders to release stock when the time for an upward turn in the combine's fortunes is thought to have come appreciably closer. Most people will be disappointed if the December index does not fulfil the promise held out by the previous month's figure; at the same time, rumour persists that an important financial development is imminent. The net result of these considerations is seen in gains of 3 points, to 105, in the price of the preference; of 1½, to 23½, in the "A" ordinary, and of ½, to 7, in the "B" ordinary. Globe Telegraph ordinary joined in the movement, rising to 14½. Marconi Marines, too, have come strongly into the picture with a rise of 3/16 to 2 1/16. Hopes are entertained of

the year's dividend being advanced by 2½ p.c. to 10 p.c. Canadian Marconis, the present butt of Montreal speculation, carried their rise further to 10s. 6d. There is activity around 12 in Radio Corporations, a popular Transatlantic gambling counter, and also in International "Tel and Tel.," which are nearly a point higher at 13⅜.

Electrical Equipment Shares

All-round steadiness, with one or two points of outstanding interest, characterises conditions in the market for electrical equipment shares, which, as a group, are acquitting themselves better than the majority of industrial descriptions. Stimulation is provided by the huge expenditure promised for railway construction and electrification work, which is sure to make profitable additions to the order books of many companies in the group. The price of Henleys, now in the form of 5s. units, is 1s. 6d. higher, at 23s., as a result of the broadening of public interest which was anticipated for the shares as a sequel to their sub-division. Johnson & Phillips went ahead from 50s. to 53s. 3d., and the rise in British Insulated was carried to 6⅞, partly by reason of persistent bonus talk. Telephone shares, too, are more active: Ericssons, 57s. 6d., and Automatic Telephone, 48s. 6d., are particularly favoured in this group. Switchgear & Cowans have risen from 19s. 6d. to 21s. 6d. Among comparative newcomers to the market, the irrepressible Crabtrees have mounted yet higher to 34s. 9d. Walsall Conduits, 31s. 6d., and Thorns, 14s. 3d., are unchanged on the week.

Crompton Parkinsons Jump

Crompton Parkinsons, which had been a quiet market at 65s., astonished their own supporters by spurting to 78s. in the course of two or three days. Sellers appeared, and the price reacted to 72s., only to harden up to 75s. By way of explanation, it is surmised that a substantial amount of money which the company is said to have earmarked for special contingencies will not be required, after all, for such purpose, and will accordingly become available for distribution to shareholders. This story has to be received, as it is repeated, with all reserve. Whether it be true or not, the violence of the price fluctuations naturally gave rise to questions—and answers.

Isle of Thanet Electric

A slump in the price of Isle of Thanet Electric ordinary is all the more noticeable for having taken place in a market unaccustomed to violent price movements. A fortnight ago the quotation was at 39s., as compared with a high point of 48s. in 1936; the price is now 28s. The company has paid 4 per cent. on the ordinary capital for a number of years, so that, from the dividend point of view only, the shares appear, even at the current price, to be comparatively highly valued. Obviously, buying of the shares up to a level where the yield became less than 2 per cent. was based on expectation—now modified, but not altogether abandoned—of developments of an exceptional kind. Chief hopes have been centred on a possible offer to purchase by a larger concern; there has been talk, too, of a bonus distribution. With the chilling of optimism in those directions has come realisation of the local authorities' powers to take over, in eight years' time, the company's electric lighting business on terms which would not, in the ordinary course of events, justify an extravagant price for the shares.

Westinghouse Brakes

Active dealings in Westinghouse Brake and Signal shares continue around 73s. 6d. ex dividend, equivalent to the slightly lower level to which the price fell before publication of the preliminary statement and dividend. The latter, with a 5 per cent. bonus tacked on to a repetition of the previous year's 10 per cent., caused no surprise. The figures, showing net profits nearly half as much again as last year's, were rather better than some people had expected. Lack of response in the price of the shares is put down to the normal run of profit-taking which commonly follows an announcement which has been the object of bullish anticipation, and to the presence in the market of another block of repatriated shares. The yield of 4 per cent. on Westinghouse shares, at their present price, is considered to be not ungenerous, having regard to the generally supposed healthy state of the company's order book, and to the fact that only half of this year's net profits was absorbed by the dividend and bonus.

Miscellaneous Matters

London Passenger Transport "C" stock turned reactionary on news of the petrol-price increase. The same factor militated against a possible response in the prices of British Electric Traction and Thomas Tilling to the announcement of an ordinary dividend, making 10 per cent. for the year, by Tilling and British Automobile Traction, which is controlled jointly by the B.E.T. and Tilling companies. The dividend is maintained, on capital increased last April by one-third, at last year's rate. South American descriptions continue to hold a good measure of attention; among them, Brazilian Tractions still figure prominently. The price has capped a rise of 1¼ in the previous week with another, this week, of ⅜., making the quotation 21½. Anglo-Argentine Tramways issues are less firm, the first preference, at 5s. 9d., being 1s. down. American labour troubles have checked activity in the rubber market, which naturally fears a falling off in consumption of the commodity as a result of disputes in the motor industry.

Share List of Electrical Companies

Home Electricity Companies.

	Nom.	Dividend. Previous.	Dividend. Last.	Price. Jan. 19.	Rise or Fall.	Yield. p.c. £ s. d.
Bournemouth and Poole	1	15	15	77/6	—	3 17 3
City of London	1	7½	7½	38/–	+6d.	3 19 0
Clyde Valley	1	7	8	45/6	—	3 9 7
County of London	1	10½	10½	54/–	—	3 17 9
Edmundson's 7% Pref.	1	7	7	35/6	—	3 18 9
Do. Ord.	1	8	8	44/6	—	3 12 0
Elec. Dis. Yorkshire	1	9	9	45/6	+6d.	3 19 0
Elec. Fin. and Securities	1	12½	12½	3 1/16	—	4 1 7
Elec. Supply Corporation	1	11	11	58/3	—	3 15 7
Lancs Light and Power	1	7½	7½	38/–	—	3 19 0
Lond. Assoc. Electric	1	—	7	35/–	—	4 0 0
London Electric	1	7	8	40/–	—	4 0 0
London Power Deb. Red.	Stock	5	5	107½	—	4 13 0
Metropolitan	1	10	10	50/6	—	3 19 2
Midland Counties	1	7	7⅛	40/6	+6d.	3 14 0
Mid. Elec. Power	1	8	8	42/6	—	3 15 3
North Eastern Electric Ordinary	1	6	6	33/–	+6d.	3 12 10
Do. 7% Pref.	1	7	7	35/–	—	4 0 0
Northampton	1	10	10	51/3	—	3 18 2
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	56/–	—	3 11 5
Do. do. 6% Pref.	1	6	6	31/6	+6d.	3 16 2
Scottish Power	1	8	8	42/–	—	3 16 2
South London	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/–	—	6 10 4
Yorkshire Elec.	1	8	8	45/–	—	3 11 0

Public Boards.

Central Electricity, 1950–70	Stock	5	5	119	−1	4 4 0
Do. 1955–75	,,	5	5	121½	−½	4 2 4
Do. 1951–73	,,	4½	4½	113	—	3 19 8
Do. 1963–93	,,	—	3½	103	—	3 8 0
London Elec. Trans. Gtd.	,,	—	2½	91	−2	2 14 9
London & Home Counties, 1955–75	,,	4½	4½	114	—	3 19 0
London Passenger Transport, A	,,	—	4½	121	−1	3 14 0
Do. do. B	,,	—	5	123½	−1	4 1 0
Do. do C	,,	3½	4	96	−2	4 3 4
West Midlands Joint Elec. 1948–68	,,	—	5	116½	—	4 5 10

Telegraph and Telephone.

American Tel. & Tel.	$100	9	9	187½	—	4 16 0
Anglo-Am. Tel. Pref.	Stock	6	6	129½	—	4 12 8
Do. Def.	,,	1½	1½	32½	+½	4 12 4
Cable & Wireless 5½% Pref.	,,	4½	5½	105	+3	5 4 9
Do. A. 7½% Ord.	,,	Nil	Nil	23½	+1½	—
Do. B. Ord.	,,	Nil	Nil	7	+⅛	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	14⅛	+⅛	3 3 9
Do. Do. Pref.	10	6	6	14½	—	4 5 0
Great Northern Tel.	10	20	20	46½	—	4 6 0
Marconi-Marine	1	10	7½	4½	+3/16	3 12 9
Oriental Telephone Ord.	1	12*	12*	3 1/16	—	3 12 6

Home and Foreign Trams, etc.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	5/9	−1/–	—
Do. do. 2nd Pref.	5	Nil	Nil	5/–	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	27½	−1	—
British Electric Traction Df. Ord.	,,	5	5	1575	−25	—
Do. do. Pref. Ord.	,,	8	8	175½	—	4 11 2
Brazil Traction	100	—	70 cts.	21⅛	+⅜	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	104½	—	4 14 0
Mexican Light Common	100	Nil	Nil	3½	—	—
Do. 1st Bonds	$500	5	5	47	—	—
Victoria Falls Ord	1	20	12	76/3	+1/16	3 3 2
West Riding	1	5	6½	47/6	—	2 14 8

Manufacturing Companies.

Aron Electricity Ord.	1	10	15	3	—	5 0 0
Assoc. Elec. Ord.	1	6	8	51/6	+6d.	3 2 0
Do. Pref.	1	8	8	39/6	—	4 1 0
Babcock & Wilcox	1	8	8	54/–	—	2 9 3
British Aluminium Ord.	1	7½	7½	45/–	—	3 6 8
British Insulated Ord.	1	15	20	6 7/16	+1/16	3 1 3
Brush Ord.	Stock	Nil	Nil	37½	−3	—
Callender's	1	15	15	4¼	—	3 3 1
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/–	12½	12½	33	+½	—
Do. 8% Pref.	1	8	8	38/9	−1/16	4 2 7
Electric Construction	1	3½	7	42/6	—	3 5 9
Enfield Cable Ord.	1	25	25	5¾	—	4 17 0
English Electric	1	Nil	Nil	32/–	—	—
Do. Do. Pref.	1	6½	6½	26/6	—	4 18 1
Ericsson Tel.	5/–	24	20*	57/6	+1/16	1 14 10
Ever Ready	5/–	35	35	32/–	—	5 9 5
Ferranti Pref.	1	7	7	28/9	—	4 17 5
G.E.C. Pref.	1	6½	6½	33/–	−1/–	3 18 9
Do. Ord.	1	10	15	92/–	−1/–	3 5 5
Henleys	5/–	30	30	23/–	+1/6	3 5 0
Do. 4½% Pref.	1	4½	4½	1⅛	—	3 5 5
India-Rubber Pref.	1	1⅛	5½	23/3	—	4 17 9
Johnson & Phillips	1	7½	10	53/3	+3/3	3 15 2
Lancashire Dynamo	1	5	10	3 1/16	—	2 16 2
Siemens Ord.	1	4	6	33/9	—	3 11 0
Telegraph Construction	£1	Nil	Nil	33/9	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1935

8604. "Electron-discharge apparatus." J. E. Keyston, F. H. Nicoll and O. Klemperer. March 19th, 1935. (Cognate application 13495/35.) (458746.)

8739. "Transmission of electrical signals having a direct current component." A. D. Blumlein. March 20th, 1935. (458585.)

8740. "Photo-electric mosaic screens for use, for example, in cathode-ray tubes." L. Klatzow. March 20th, 1935. (458586.)

11837. "Conduction of high-frequency electric fields." F. K. Nagelschmidt. April 17th, 1935. (458505.)

11908. "Rectifier circuit arrangements. Marconi's Wireless Telegraph Co., Ltd., and N. H. Clough. April 17th, 1935. (458589.)

14279. "Apparatus for testing objects with filtered ultra-violet rays." Quarzlampen Ges. May 15th, 1934. (458668.)

14329. "Electrical ignition systems." General Motors Corporation. May 28th, 1934. (Addition to 427679.) (458592.)

14344. "Electric power systems." Westinghouse Electric & Manufacturing Co. May 19th, 1934. (458508.)

14639. "Rotating field synchronous electric motors with asynchronous starting arrangements." Siemens-Schuckertwerke Akt.-Ges. May 18th, 1934. (458671.)

14936. "Electrolytic apparatus." D. J. Evans and E.C.D., Ltd. May 22nd, 1935. (458594.)

15103. "Metal mesh screens, for example, for use in cathode-ray tubes." H. E. Holman. May 23rd, 1935. (Cognate application No. 31199/35.) (458675.)

15152. "Connectors for electrical conductors." C. H. Jasper. May 24th, 1935. (458749.)

15171. "Television and like transmitters." Marconi's Wireless Telegraph Co., Ltd. May 26th, 1934. (458750.)

17329. "Radiation-therapy." F. W. O. Bauch. June 15th, 1935. (458677.)

17412. "Regenerative transmission systems for vehicles." R. Chilton. June 23th, 1934. (458678.)

17619. "Electrical contacts and a method of mounting on a panel or support." C. R. Cook. June 19th, 1935. (458681.)

17889. "Control arrangements for allocating a common route to different groups of traffic, for example, in telephone systems." Standard Telephones & Cables, Ltd., E. P. G. Wright and G. C. Hartley. June 21st, 1935. (458838.)

17941. "Radio direction-finding and sense-finding." L. L-K. Honeyball. June 22nd, 1935. (458820.)

18064. "Mounting of electric contacts." C. R. Cook. June 24th, 1935. (458840.)

18170. "Concentric conductor electric cables." Standard Telephones & Cables, Ltd., and W. K. Weston. June 25th, 1935. (458772.)

18210. "Mercury arc rectifiers." British Thomson-Houston Co., Ltd., and J. C. Read. June 25th, 1935. (458777.)

18247. "Electrically tripped or released switches." F. B. Cox. June 26th, 1935. (458779.)

18301. "Electric condensers, resonant circuits and inductances." H. W. Sullivan, Ltd., and W. H. F. Griffiths. June 26th, 1935. (458691.)

18326. "Electrical recording devices comprising cathode-ray tubes." A. C. Cossor, Ltd. June 27th, 1934. (458599.)

18336. "Optical sound recording or reproducing apparatus and records." British Thomson-Houston Co., Ltd., G. S. C. Lucas and S. R. Eade. June 26th, 1935. (458784.)

18429. "Television or like systems." Baird Television, Ltd., T. M. C. Lance and E. H. Foden-Pattinson. June 27th, 1935. (458791.)

18493. "Overload and other release devices for use in electric circuit-breakers, and the like." G. E. Crabtree, W. T. Elliott, E. Badham and R. W. Thornton (Legal representatives of J. A. Crabtree, dec.). June 28th, 1935. (Addition to 436589.) (458826.)

18519. "Electric switches for controlling road vehicle direction-indicators." J. Lucas, Ltd., and O. Lucas. June 28th, 1935. (458796.)

18544. "Radio-receivers." Marconi's Wireless Telegraph Co., Ltd. June 28th, 1934. (458798.)

18566. "Radio receiving apparatus." Kolster-Brandes, Ltd., and C. W. Earp. June 28th, 1935. (458801.)

18729. "Design of gas discharge tube electrode housings and the connection of electric conductors thereto." E. S. S. Signs, Ltd., and A. H. C. Deacon. July 1st, 1935. (458830.)

18813. "Electrical heaters and resistances." Expanded Metal Co., Ltd., and R. A. Clay. July 1st, 1935. (458844.)

20447. "Aerial for wireless reception." R. V. Philpott. July 18th, 1935. (458602.)

20775. "Luminous electric-discharge lamps." General Electric Co., Ltd. (Patent Treuhand Ges. für Elektrische Glühlampen). July 22nd, 1935. (Addition to 432614.) (458603.)

21217. "Method and arrangements for operating colour-changing gaseous-discharge tubes." Dr. S. P. Rety and L. Jellinek (Dr. Z. Bay.) July 25th, 1935. (458697.)

21223. "High-pressure metal-vapour electric-discharge devices." General Electric Co., Ltd., and V. J. Francis. July 25th, 1935. (458604.)

23602. "Locking-devices for electric-lamp holders." R. O. Hughes. August 22nd, 1935. (458610.)

24878. "Systems for communication over power lines." General Electric Co., Ltd., and D. A. Ley. September 6th, 1935. (458612.)

26491. "Asymmetric lighting fittings." General Electric Co., Ltd., and W. F. S. Debenham. September 24th, 1935. (458617.)

26605. "Television scanning apparatus." Ferranti, Ltd., and M. K. Taylor. September 26th, 1935. (458618.)

27225. "Electric incandescent lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. November 2nd, 1934. (458620.)

28864. "Thermionic valves." J. M. Dodds and Metropolitan-Vickers Electrical Co., Ltd. October 18th, 1935. (458702.)

31471. "Electric batteries." Compagnie Générale d'Electricité. January 14th, 1935. (458529.)

32679. "Protective arrangements for compound-wound electric motors." F. Whyman and Metropolitan-Vickers Electrical Co., Ltd. November 25th, 1935. (458705.)

33879. "Treatment of bodies by electromagnetic radiation." C. Lorenz Akt.-Ges. December 6th, 1934. (458534.)

35095. "Electrostatic inductors, particularly for use as attenuators." General Electric Co., Ltd., J. B. L. Foot and E. G. James. December 18th, 1935. (458710.)

36351. "Writing telegraphs." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). December 20th, 1935. (458711.)

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3675. "Magnetron tubes." J. Pintsch Akt.-Ges. February 28th, 1935. (Cognate applications 3676/36, 3677/36 and 3678/36.) (458631.)

4239. "Impulse transmitters for telephone systems." W. D. Henderson. February 12th, 1936. (458713.)

5035. "Electric transforming and rectifying equipment." Ericsson Telephones, Ltd., and L. S. Distin. February 19th, 1936. (458716.)

5562. "Fluorescent screens." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 29th, 1935. (458635.)

7693. "Distributors for cables, more especially for television cables." Siemens & Halske Akt.-Ges. March 18th, 1935. (458641.)

10550. "Telephone or like systems, and hunting switches therefor." Standard Telephones & Cables, Ltd., E. P. G. Wright and G. C. Hartley. June 21st, 1935. (Divided out of 458838.) (458845.)

10551. "Switch circuits for use in telephone or like systems." Standard Telephones & Cables, Ltd., E. P. G. Wright and G. C. Hartley. June 21st, 1935. (Divided out of 458838.) (458725.)

15276. "Electronic tubes." P. M. G. Toulon. May 31st, 1935. (458564.)

15402. "Electro-optical systems." Standard Telephones & Cables, Ltd. May 31st, 1935. (458654.)

15411. "Superheterodyne receiving circuits." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 6th, 1936. (458655.)

15433. "Thermionic amplifier circuits." Wired Radio, Inc. July 9th, 1935. (458565.)

15635. "Navigation-aiding and like radio systems." Telefunken Ges. für Drahtlose Telegraphie. June 4th, 1935. (458734.)

15646. "Photo-electric cells." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 5th, 1935. (458783.)

15950. "Electric contact devices operated by rail deflection on the passage of a train." Felten & Guilleaume Carlswerk Akt.-Ges. June 8th, 1935. (458657.)

17164. "Metal mesh screens, for example for use in cathode-ray tubes." H. E. Holman. May 23rd, 1935. (Divided out of 458675.) (458736.)

22213. "Small self-starting synchronous electric motor." Landis & Gyr Akt.-Ges. August 22nd, 1935. (Addition to 418174.) (458742.)

28088. "Electron-discharge apparatus." J. E. Keyston, F. H. Nicoll and O. Klemperer. March 19th, 1935. (Divided out of 458746.) (Cognate application 28089/36.) (458744.)

33124. "Apparatus for arc-welding." Babcock & Wilcox, Ltd, June 16th, 1934. (Divided out of 17325/35.) (458580.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from January 13th :—

Permatex. No. 573503. Class 8. Electric batteries (not for medical purposes).—Joseph Lucas, Ltd., Great King Street, Birmingham.

Duplo. No. 566558. Class 13. Electric lamps for motor vehicles.—Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.

Kneeling Man (design only). No. 572311. Class 13. Electric lamps (ordinary).—Atlas Lamp Works, Ltd., 105, Judd Street, King's Cross, W.C.1.

Dragor. No. 572613. Class 18. Electric water-heating cisterns and electric washing coppers.—Drake & Gorham Wholesale, Ltd., 77, Long Acre, W.C.2.

Electric Blasting

The advantages of electric blasting were enumerated by Mr. R. R. Vail, general manager of the Vlakfontein Gold Mining Co., Ltd., in a paper which he read at a recent meeting of the South African Institution of Engineers. He said that the company introduced electric blasting at the beginning of last year. The present cost was in the neighbourhood of £4 10s. per blast, or 35s. more than with safety fuse. The apparent advantages were that the sinking crews and drivers were relieved of the usual tension when blasting with fuse; there was only 1 per cent. misfires against 3.3 per cent. for 300 previous blasts; breaking was improved and there was less damage to shaft timber, accurate timing with fuse being difficult in a large shaft; the round was so broken that the rock lay piled high in the centre of the shaft, and the outside skips could be filled to a certain extent from above; a round of 100 holes could now be charged up comfortably in 30 min. Before changing over to electric blasting, a full size model of the shaft bottom was laid out on the ground on the surface. Short lengths of 1 in. pipe were sunk in the ground to represent the drilled holes, and dummy electric detonators and primers prepared. The sinking crews were trained and drilled in the correct charging-up procedure

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aldridge.—Houses (129), new roads near Old Town Lane, Pelsall, for T. E. Grove.

Ayr.—Cinema, Burns' Statue Square (£37,000); Odeon Theatres, Ltd., 49, Park Lane, London, W.1.

Barnsley.—Houses (30), Coronation Road, Monk Bretton; C. D. Potter & Son, Ltd., builders, 110 Doncaster Road.

Belford (NORTHUMBERLAND).—Houses (44); R. Carse and Sons, builders, Amble.

Birmingham.—Baths, Kingstanding (£20,278); city engineer. Factory, Lower Essex Street, for Jarrett & Laughton, Ltd., Kent Street (£30,000), with electrical work; Plant, Ltd., builders, Erdington.

Blackheath (WORCESTERSHIRE).—Cinema, Halesowen Street, for the Midland Cinema Pictures, Ltd.

Braughing (HERTS).—Houses (22); R.D.C. surveyor.

Catrine (AYRSHIRE).—Houses (130), for C.C.; Duncan M'Crae, Cumnock.

Chepstow.—Cinema, for the Gaumont British Picture Corporation.

Cheshire.—Extensions to Mental Hospital, Parkside (£160,000); F. Anstead Browne, county architect, The Castle, Chester.

Chesterfield.—Houses (64), Boythorpe (£28,784); Wm. Drabble & Sons.

Coulsdon.—Showrooms, shops and flats, Brighton Road and Windermere Road; K. L. M. Motors. Ltd.

Darlington.—Houses, Marwood Crescent; Bussey and Armstrong, builders, Brinkburn Road.

Dartford.—Milk depôt, Lowfield Street; United Dairies, Ltd.

Derbyshire.—School, Bolsover; county architect, County Offices, Derby.

Dudley.—Houses (35), Hall Street, Wood Side; W. Heathcote, builder, 9, Wood Street, Wood Side.

Dumbarton.—Buildings for Hiram Walker & Sons (Scotland), Ltd., Glasgow.

Dumfries.—Houses (34), Nithside (£12,800); J. Barker, burgh surveyor, Municipal Buildings, Dumfries.

Eccles.—Factory, Roberts Street; Hugh Wilson, Ltd. Extensions to Vulcan works, Green Lane; Mitchell, Shackleton & Co., Ltd.

Essex.—Hospital, Dagenham; county architect.

Folkestone.—Houses (67), Dellas Brett Crescent; borough surveyor.

Gateshead-on-Tyne (Co. DURHAM).—Cinema, High Street; P. L. Browne & Sons, architects, Pearl Buildings, Newcastle-on-Tyne.

Gloucester.—Technical college (£90,000); Hickton & Madeley, architects, Wolverhampton and Walsall.

Golborne.—Houses (156), near Newton Road, Elm Tree Farm; U.D.C. surveyor.

Haworth (YORKSHIRE).—Houses (26), Vale Mill Lane; Worth Valley Estates, Ltd., Cross Roads.

Hebburn-on-Tyne.—Cinema, Victoria Road West, for Dawe Brothers, Gibb Chambers, Westgate Road, Newcastle-on-Tyne. Extensions to foundry, for Palmers Hebburn Co., Ltd.

Hill of Beath (FIFESHIRE).—Houses (40); James Scott & Co., Chapel Street, Dunfermline.

Horwich.—Factory, Red Moss, for the Lancashire Peat Moss Litter Co., Ltd.

Huddersfield.—Houses, Fannymoor estate, and Dryclough estate; borough surveyor.

Irish Free State.—(DUBLIN).—Houses; H. G. Simms, housing architect, 3, Parliament Street, Dublin.

King's Norton.—Hotel, Redditch Road, for Mitchells & Butlers, Ltd., Cape Hill, Birmingham; J. & A. Brazier, Ltd., builders, Worcester Road, Bromsgrove.

Lanarkshire.—Reconstruction of Merry Street school, Motherwell (£12,800); architect, County Council, Hamilton.

Lincolnshire.—School, Burgh-le-Marsh, for E.C.; P. Birkett, county architect, County Offices, Lincoln.

London.—(DEPTFORD).—Shops, Revelin Road; Royal Arsenal Co-operative Society, Ltd. (FOREST HILL).—Houses, Tewkesbury Avenue; H. Macintosh, 7, Carteret Street, S.W.1. Factory, Perry Vale; E. J. Harman, 154, King's Road, S.W.3. (SYDENHAM).—Factory, Kent House Lane; Hall, Williams & Co., 43, Bedford Square, W.C.1.

Manchester.—Houses (34), Parkville Road, Ferndene Road, Mordale Avenue, and Woodgate Drive, Withington; Moston Brick & Building Co., Ltd., Kenyon Lane, Moston. Houses (27), Rochdale Road, Blackley; Greenwood & Tyson, Victoria Avenue estate, Rochdale Road, Blackley. Houses (338) and shops, Fox Holes estate, Blackley; Winter Bros., Bolshaw Road, Handforth, Cheshire. Houses and wash-houses, Hill Crescent and High Cliffe Road, Crumpsall; A. J. Jackson, 64, Kearsley Road, Crumpsall. Houses, shops and garages, Platt Lane and Hart Road, Withington; Commercial Estates, Ltd., 76, Mosley Street, Manchester.

Margate.—School, Westgate-on-Sea (£39,243); Rice & Sons, Ltd., Margate.

Middlesbrough.—Houses (94), on land adjoining the Marton Grove estate; S. Coates, Ltd., builders. Houses (62), to rehouse slum dwellers; borough engineer.

Minehead.—Police station, courthouse and superintendent's house (£27,401), for the Somerset Standing Joint Committee; Building and Public Works Construction Co., Ltd., Swindon.

Nairn.—Additions to Highland Hotel (£20,000); the manager.

Newcastle (STAFFORDSHIRE).—Houses (173), and bungalows, Cross Heath site; borough surveyor.

Newcastle-on-Tyne.—Business premises, Shields Road, for J. Tait, and shops and offices, Sutton Street, for Newcastle Model Milk Co., Ltd.; W. Riddle, architect, 53, Denham Terrace, Wallsend-on-Tyne.

Northern Ireland.—(BELFAST).—Premises at the corner of Queen's Square and Donegall Square, for the Imperial Tobacco Co. (of Gt. Britain and Ireland), Ltd.

Norwich.—Two shops and houses, Barrack Street; E. J. Cutmore.

Nuneaton.—Premises, Abbey Gate, for Prices Tailors, Ltd., Leeds.

Oxford.—Church of St. Luke fronting Oxford Road (electrical work); H. S. Rogers, architect, 119, St. Aldates.

Paignton.—Houses (36), near Broadlands Road; Primley estate.

Plymouth.—Administrative buildings, Roborough aerodrome; city engineer.

St. Andrews.—Houses (80), Lamond Drive; R. Bell, 10, Alexander Place.

Scarborough.—Houses (24), Seamer Road; F. Baker.

Sedgley.—Site development of Arcal Street; Stephen Cox & Son, Ltd.

Sheffield.—Factory, Penistone Road, for Hack Saws, Ltd., Aven works, Caple Street, Owlerton; A. Bradbury & Son, builders, Cemetery Road, Sheffield.

Shrewsbury.—Houses (120), Wingfield Close (£42,663); Edmund Johnson, Ltd., builders, Stoke-on-Trent.

Somerset.—Colony for mental defectives, Sandhill Park, Bishop's Lydeard, with kitchen, laundry, boiler house, &c. (£73.035), for C.C., and school buildings, Frome; A. J. Toomer, county architect, Park Street, Taunton.

Southampton.—Theatre and hotel on site of Polygon Hotel (£150,000); L. Hart, director of the Southampton Repertory Theatre.

Spalding.—Houses (26), Low Roads; Allen & Co., builders.

Stirling.—Houses (60), Whitefield, Lennoxtown, for C.C.; D. W. Glass, architect.

Stockton-on-Tees.—Houses, Rudds Lane; G. P. Stainsby, architect, 25, High Street.

Stoke-on-Trent.—Office block, Station Street; Sambrook Bros., Ltd., builders, Hamil Road, Burslem. Offices and showrooms, Campbell Road; Ray & Powell, Ltd., builders, Little Chell, Staffordshire.

Surrey.—School, Walton-on-Thames, and conversion of school, for County E.C. (£20,793); E. Clarke & Sons, Ltd., builders.

Swansea.—Houses (26), Brookvale Road; G. Mogridge. Cinema, Eversley Road; Oscar Dennis. Cinema, Sketty Cross; Max Corne, 7, St. Andrews Crescent, Cardiff.

Taunton.—Houses (24), Vera Street; Miss E. Parker.

Torquay.—Wing to the Hotel Riviera, Park Hill Road; G. C. Ratcliff.

Truro.—Houses (73), Trelander; city surveyor.

Walsall.—Shops, Stafford Street, and factory, Wisemore (£17,114); borough engineer. School, Fullbrook (£57,700), for E.C.

West Hartlepool.—Houses (60); North-Eastern Housing Association, Northumberland Road, Newcastle-on-Tyne.

West Wylam (NORTHUMBERLAND).—Premises for the Co-operative Society; W. C. Christie, builders, Prudhoe-on-Tyne.

Weymouth.—Houses (206); borough surveyor.

Wincanton.—Houses (23); R.D.C. surveyor.

Witham (ESSEX).—Houses (52), Church Street estate; U.D.C. surveyor.

Worksop.—Co-operative stores and houses, Carlton Road, for the Worksop Co-operative Society, Ltd., 16-20, Eastgate; G. Bowles & Son, builders, 107, Gateford Road.

Worthing.—Houses (77), Offington Hall estate; Hugh Williams. Development of Manor House site, Lansdowne Road, for Dr. A. Morford; H. M. Potter, architect.

York.—Houses (205), Water Lane (£79.096); Tarran Industries, Hull. Houses (128) and flats (£59,060); Sheriff & Son, Leicester.

New Sound-film Devices

EQUIPMENT for measuring film flutter, the distortion caused by variations of film speed and density, is announced by Western Electric Co., Ltd., as a further step in the improvement of sound motion picture quality. The new equipment was recently demonstrated in New York by Mr. V. Subrizi, of the research staff of the Bell Telephone Laboratories. It is a further development of the "flutter bridge" which was announced last year and makes use of the "filter" principle to separate the sound frequencies, permanent records of the measured data being made on a moving paper tape for detecting and identifying various types and degrees of flutter as experienced in the theatre. A system of transmission tests designed to measure accurately the sound quality in theatres equipped with Western Electric installations has also been evolved. The frequency response is measured by a power level meter calibrated in decibels, which is connected to the output of the sound system, while a laboratory-calibrated multi-frequency test film is running through the reproducer set. Measurements made at several frequencies provide data which show whether the sound system is reproducing faithfully the entire range for which it was designed. For measuring the gain of the system one frequency only is used and corrected for the losses which have been inserted into the system in the form of faders, gain controls, attenuators, etc. Overload measurement determines whether the sound system can provide the capacity desired without causing harmonic distortion. This is checked by determining the maximum power level which can be obtained at the output without failing to increase in step with the input level.